



DScan User Manual

Version 2.0

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Moving **Innovation**

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1 Intro



02/07/2012

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2 Overview

DScan is an high-accuracy, high-performance structured light scanner that is extremely user-friendly and can export data into the most common formats used by CAD/CAM applications.

Dscan has been developed specifically for the dental industry as an open and completely customizable system, and it is offered to OEM companies that want to brand the instrument and integrate it into their product lines. EG Solutions offers a complete customization of the scanner (both the software and hardware) by fulfilling OEM-specific technical and design requests.

The high accuracy and the robust technical features of **Dscan**, the unique design of the optics for example, enables technicians to acquire complete arc jaw, stumps and impressions. The scan process is completely automated and uses two synchronized axes controlled by an industrial programmable logic controller (PLC). Users can customize the acquisition strategies and parameters.

Dscan key features include:

- High accuracy and reproducibility: accuracy as high as 15 microns, tested in a metrology environment;
- Customizable acquisition strategies: arc jaw, stumps, bridges, antagonists, gum and wax up;
- Impression acquisition;
- Maximum reliability: high quality mechanical and electronic components;
- Open system: dataset are exported in common formats, including STL, PLY and ASC which can be read by any CAD|CAM system;
- Compact size: **Dscan**'s reduced size and weight means it can fit in any laboratory;
- Lifetime license: maintenance and update fees available upon request.

**DScan** technical specifications:

3D Scanning principle	<i>Structured light</i>	
Camera resolution	<i>1.3 megapixel</i>	
Light source	<i>LED, 150 ANSI-lumen</i>	<i>30.000 hours</i>
Rotary stage	<i>2 axis movement</i>	<i>Rotation, Tilting</i>
3D scanning area (W x H x D)	<i>90 x 80 x 55 mm</i>	
Accuracy	<i>0.015 mm</i>	
Point distance	<i>0.04 mm</i>	
Input data format	<i>STL, ASC, PLY, OBJ</i>	
Output data format	<i>STL</i>	
Interface	<i>USB 2.0, Ethernet</i>	
Size (W x H x D)	<i>250 x 450 x 450 mm</i>	
Weight	<i>13.5 kg</i>	

3 What's New

Rev 2.0

DScan Application

1. New Add Acquisition command
2. New Registration command
 1. Apply is available to register more teeth without closing the registration tool
 2. If two meshes are close each other is possible to register them directly without using the three points strategy
 3. The three registration points can be resetted only for float or fixed window using context menu
3. Neighbours and pontic gengiva are automatically defined
4. Antagonist and gum segmentation is no more required
5. Workarea is now defined during total model acquisition
6. Now it is possible to change the hight of the acquisition area before the scan. A parameter is added in the scan dialog box
7. ESC close the active selection command
8. New Revert Selection command
9. Bottom teeth or arc jaw big holes are no more selectable by fill hole command. The max lenght of the holes boundaries can be setted by a parameter
10. Now it is possible to visualize the tessellation also in Dscan
11. User_scan_setting.xml contains customer scan cycles, it is used to overwrite default cycle during a dental job or in Basic Mode.
12. Exocad Integration: Double arc jaw job definition is fully supported

Rev 1.1

DScan Application

1. New option to skip wrong scanned teeth during multidie acquisition

4 Installation

To steps required to work with DSCan and DentalSuite are:

1. Unpacking and connecting the hardware
2. Installing and configuring the software
3. Testing the installation

Be sure to check the Connections Reminder before proceeding

[| >>>](#)

4.1 Connections Reminder

Connections reminder

DScan uses USB 2.0...



Standard USB 2.0 sockets



PC end of a standard USB 2.0 cable

RJ45...



RJ45 socket



Standard RJ 45 cable

and VGA connectors...



Standard VGA socket



PC end of a standard VGA cable

DVI and HDMI cables **can** be used to connect external devices (monitors, TV, displays...) to the PC, they're not included in the DScan package.



Standard DVI socket



Standard DVI cable



Standard HDMI socket



Standard HDMI cable

At the moment, DScan will NOT work when connected to USB 3.0 sockets.



Standard USB 3.0 sockets



PC end of a standard USB 3.0 cable

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4.2 Hardware Installation

Unpackaging and connecting the hardware

1. If you're using a custom PC, verify that the recommended requirements are satisfied
2. Unpackaging the scanner
3. Connecting the scanner to the PC
4. Turning on/off sequence

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4.2.1 System Requirements

The following configuration is RECOMMENDED for best results:

- **Processor:** Intel Core i7 or higher;
- **Memory:** 8 GB or higher;
- **Video card:** Nvidia 5xx series or higher / ATI 5xxx series or higher, with 1Gb or more video ram;
- **Operating system:** Windows 7 64bit*;
- **Network interface card:** 2 x RJ45 Ethernet adapters or 1 x RJ45 Ethernet adapter + 1 x Wireless adapter.

* **64bit OS is a mandatory requirement for the DentalSuite**

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4.2.2 Hardware Unpackaging

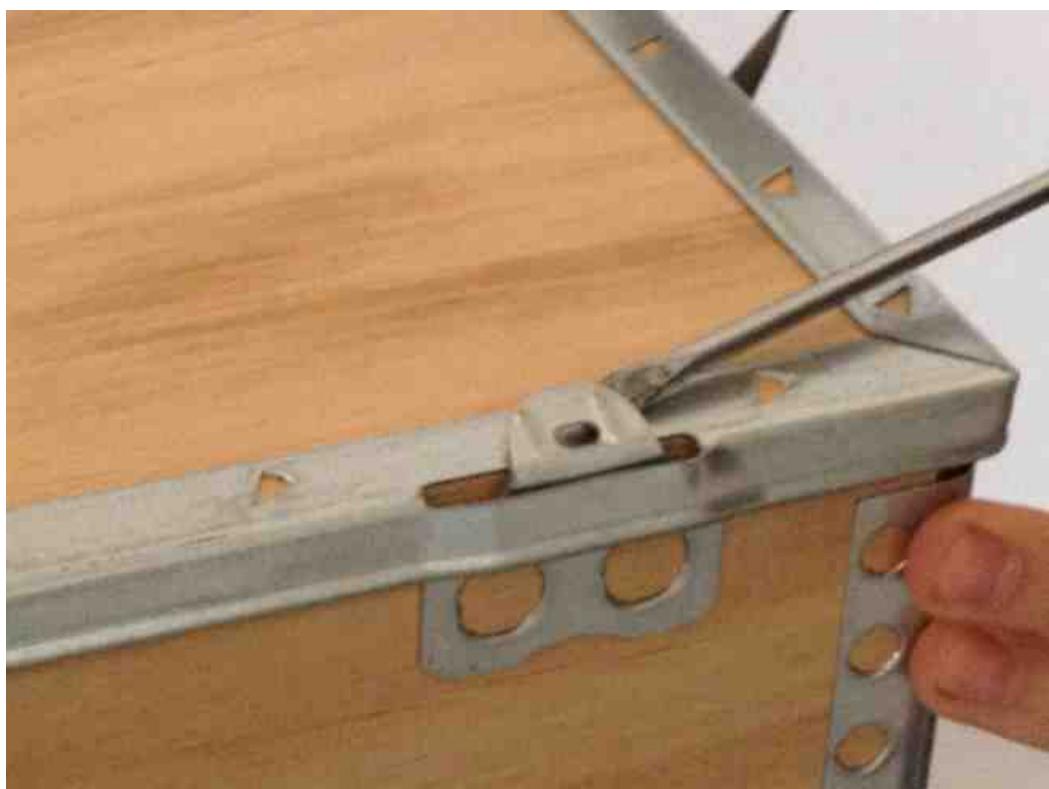
Unpacking DScan

The DScan is shipped inside a wooden box.

You need a slotted screwdriver to open it:



1. Bend the eight stops using the slotted screwdriver to release the top cover plate:





2. Remove the top cover:



3. Remove the cardboard box containing the accessories:



4. Raise the scanner and the foam protections using both hands:



5. Place the scanner on the floor:



6. Remove the two lateral foam protections:



7. Remove the protection bag and move the Scanner on a table close to the PC;
8. Open the frontal cover and check the position of the rotating table. If the position is not horizontal gently move it manually until it is more or less aligned with the inner cover. Reset Axis operation will be performed later in order to achieve the perfect rotary plate position.

Warning: Do not perform this operation if the scanner is turned on!

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4.2.3 Box Contents

Box Contents

The scanner is packed with all the accessories required to connect and operate.

They are stored inside the cardboard box:



A) One CD containing:

1. Calibration files;
2. Software files;
3. Documentation.

B) Blu Tack adhesive;

C) AC power cord;

D) Flat circular plate;

E) Multi-die plate;

F) Calibration grid;

- G) RJ45 cable;
- H) USB cable;
- I) Projector remote control;
- L) VGA video cable.

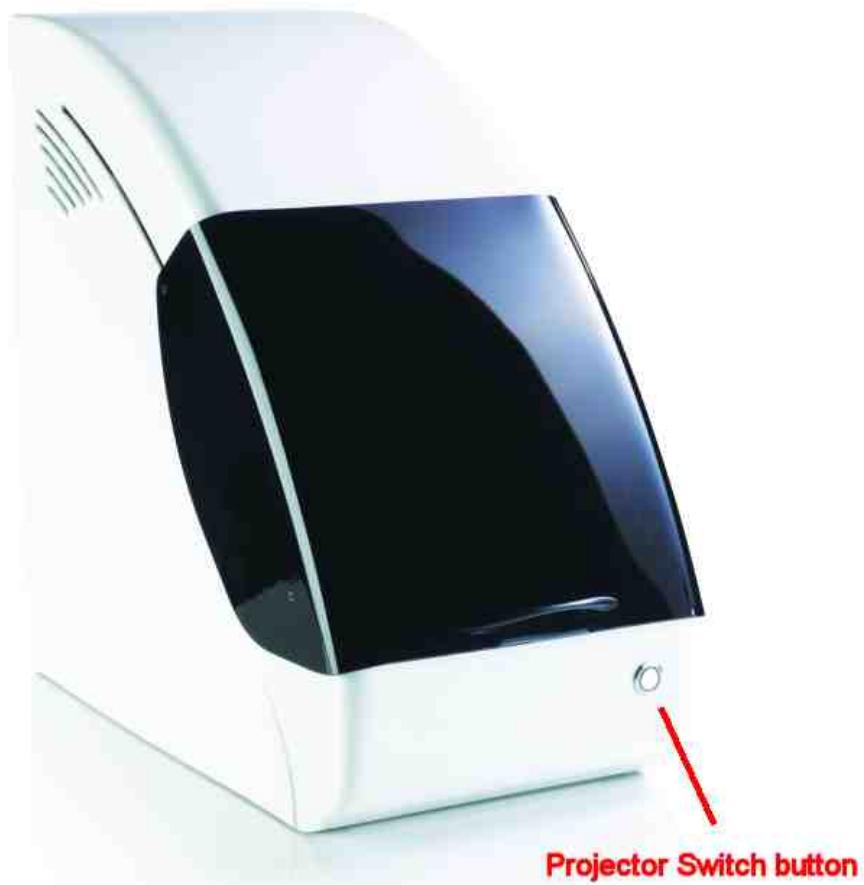
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4.2.4 Hardware Connections

Hardware Overview

The **DScan** is provided with two power switches and several sockets;

The projector switch button is on the frontal panel:



In the back panel:

1. Power switch: general power button;
2. AC socket;
3. VGA connector;
4. USB connector;

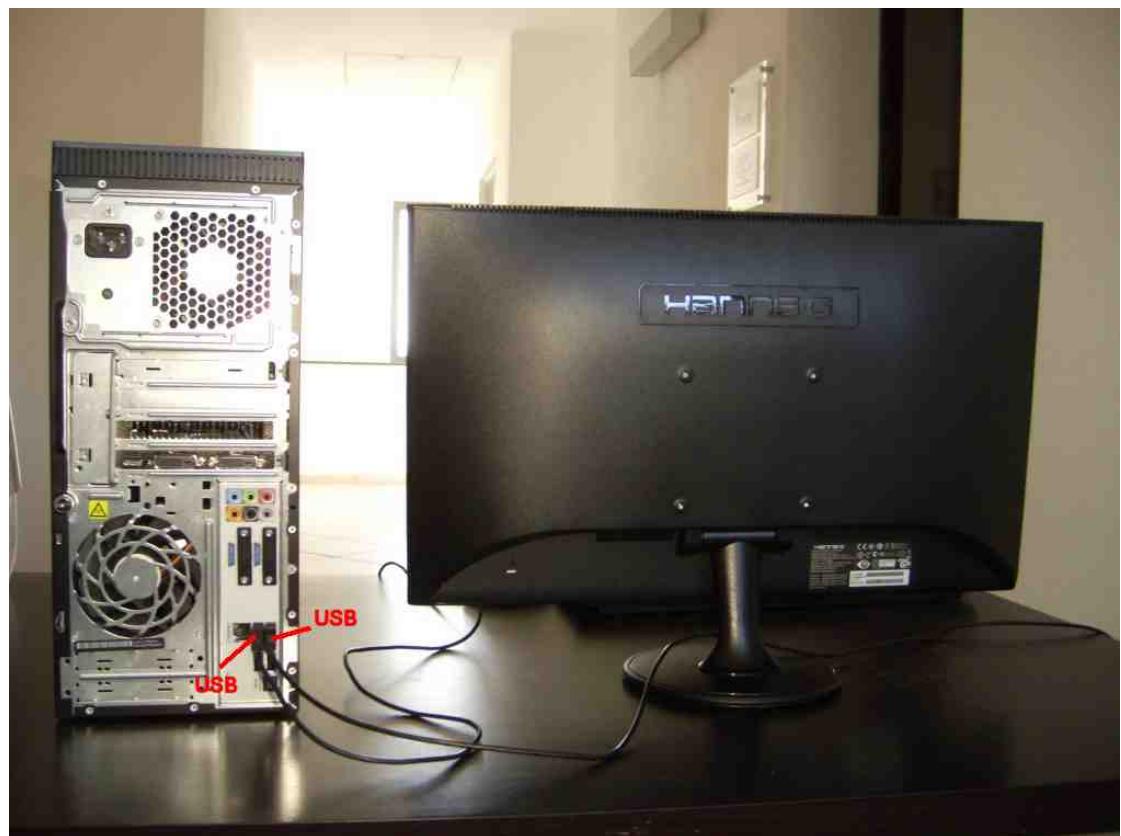
5. RJ45 connector.



PC Scanner connections

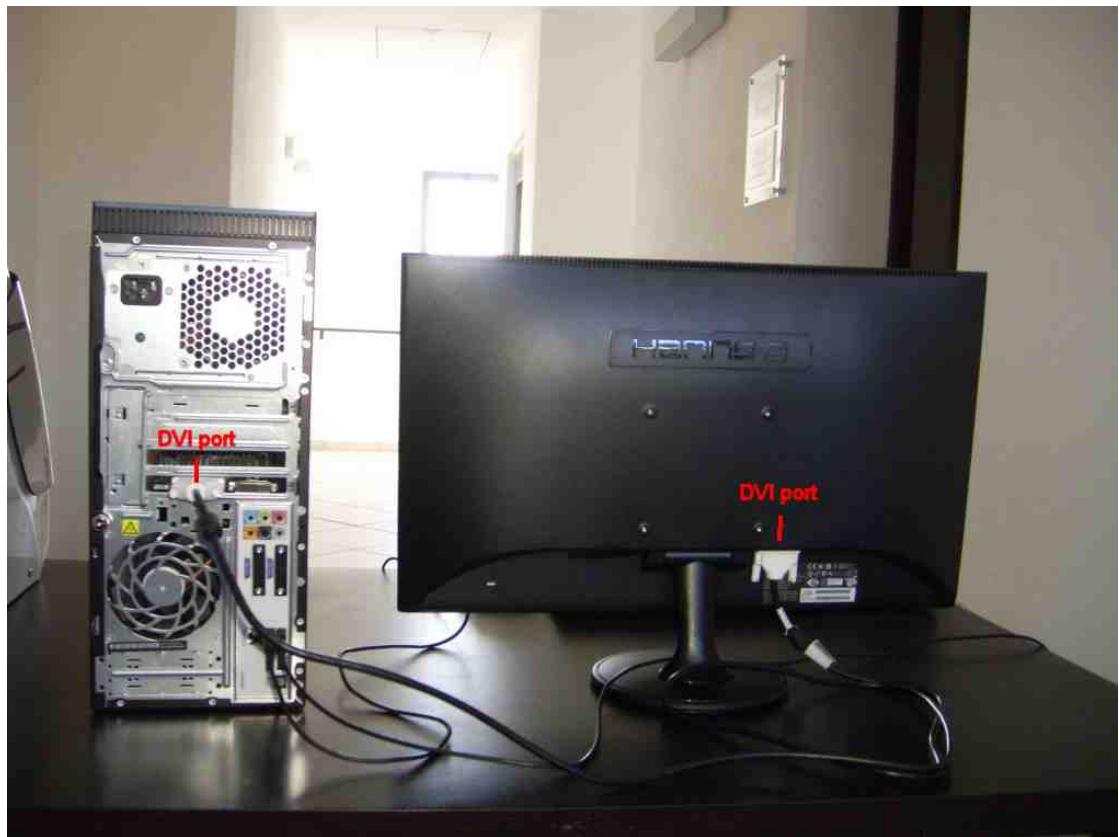
1. Be sure to check the Connections Reminder before proceeding!
2. Connect the mouse and the keyboard using two USB ports in the PC back panel.

The PC can be provided by a wireless connection for the mouse and keyboard, in this case only one USB port is used.

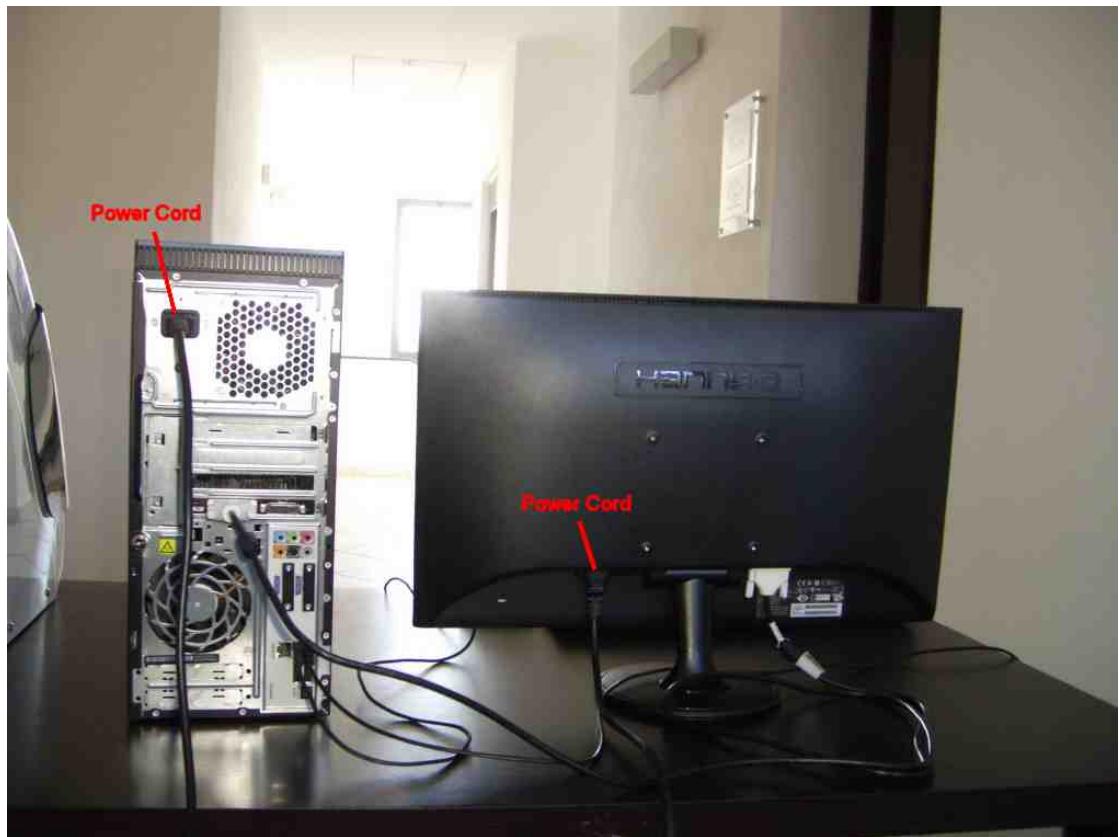


3. Connect the the first PC DVI port to the monitor DVI.

Depending from the graphical device and monitor also VGA cable can be used. Sometime can be used adapters DVI-VGA in order to connect the PC and the scanner projector.



4. Connect the PC and Monitor to AC . The PC has to be switched off before connecting the Scanner.



5. Connect a free PC USB 2.0 port to the scanner USB.



6. Plug the PC RJ45 port to the Scanner RJ45. The PC and the scanner have to be directly connected.



7. Place the VGA cables on the back of the Scanner and in the second DVI PC port (an adapter DVI -VGA not included is required depending from the PC graphical device installed).



8. Plug the Power Cord on the back of the Scanner device.



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4.2.5 Turn on/off sequence

Turning on sequence

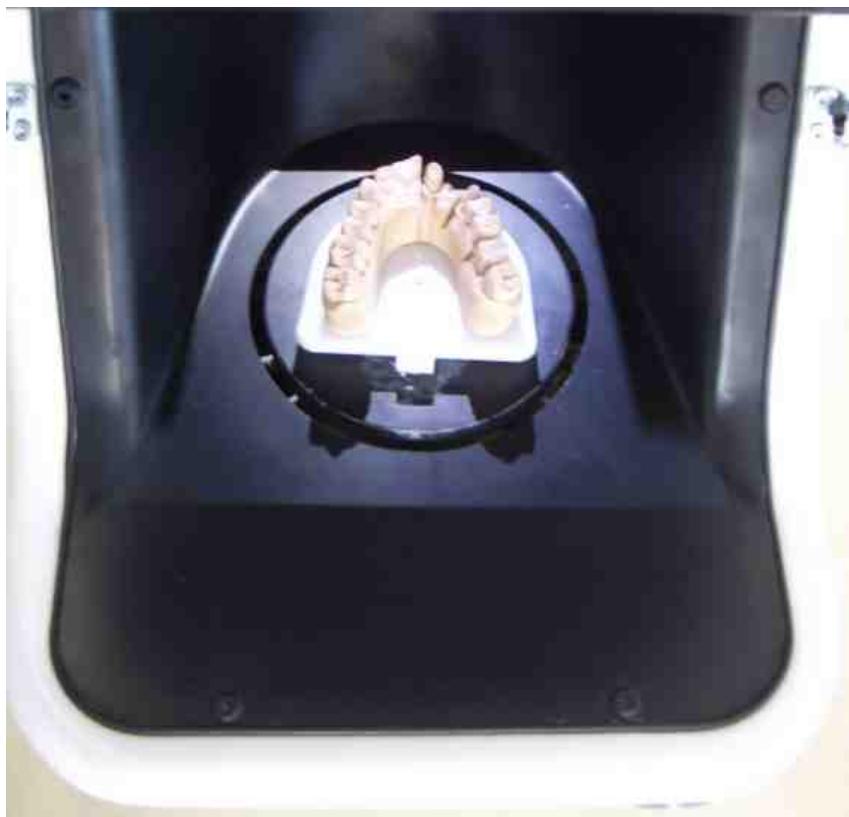
1. Turn on the PC;
2. Turn on the scanner using the **power switch** on the back of the device;



3. Turn on the projector using the frontal switch button.



The projector should illuminate the rotary table of the scanner with a white light like the image below:



If some icons are visible, it means that the input source is wrong, **the image should be the same as in your desktop:**



To solve the issue press the source button in the remote control, **usually it needs to be pressed just once**:





Turning off sequence

1. Turn off the projector using the frontal button;
2. Turn off the scanner using the power switch;
3. Turn off the PC.

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4.3 Software Installation

Software installation

Before installing and configure the software, the Scanner and PC have to be properly connected and turned on in the right sequence.

The Software installation is a three steps process:

1. Driver Installation
2. Dental Suite Installation
3. Configure System

An Internet connection has to be active in order to correctly register the software with a keycode license

Warning: If a PC is shipped together with the scanner this step is not required

Antivirus software MAY hinder license registration, see here for details.

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4.3.1 Driver Installation

To run the installation of the mandatory software FlexScan, which is required for the *DentalSuite* to work correctly, just click on the first button of the **DentalSuite Setup**:



The Flexscan 3.0 Installer will run. Follow the video instruction keeping all the default proposed by the system.

Upon completing the installation FlexScan 3.0 may prompt you for a reboot, it MUST be done in order to correctly install the software.

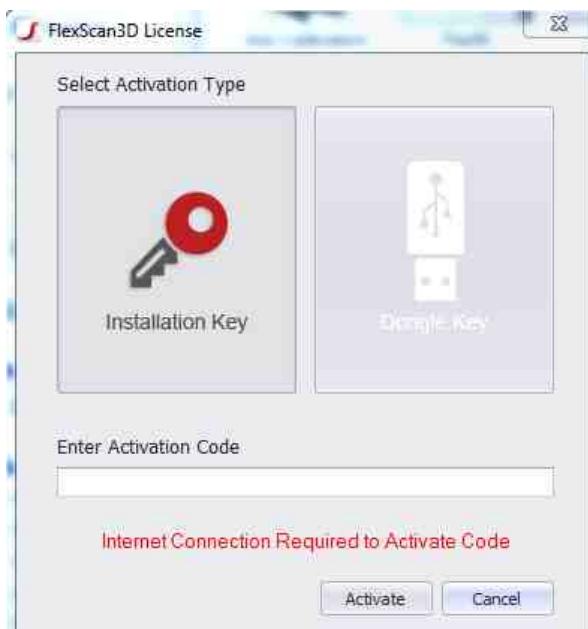
Upon rebooting the projector source may be wrong, click here to solve the problem.

Licensing

Upon launching Flexscan 3D 3, you will be prompted to insert the license code, to do so.

Send an email to egs-info@egsolutions.com and we will forward you your registration data to copy in the empty fields of the registration window

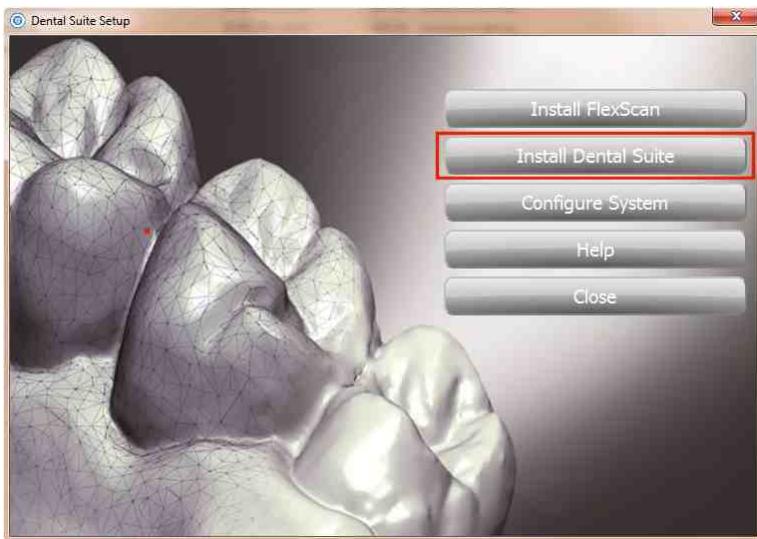
An Internet connection is required to correctly register the software with a keycode license



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4.3.2 DentalSuite Installation

To run the *DentalSuite Installation* required just a click on the second button of the **DentalSuite Setup**:



The *DentalSuite Installer* will run. Follow the video instruction keeping all the default proposed by the system.

Licensing

Upon launching **DentalCAD**, you will be prompted to insert one of the following two items depending from the version installed:

1. the dongle
 1. insert the dongle in a free USB 2.0.
 2. Restart the software
2. the license code
 1. In the emerging window copy down the "hardware fingerprint" code that will appear in two 4 digits/letters tokens separated by a hyphen (eg. xyzw-wzxy).
 2. Send an email to egs-info@egsolutions.com with this code, and we will forward you your registration data to copy in the empty fields of the REGISTRATION window.



A network card must be active in the system in order to correctly register the software with a keycode license, if not hardware fingerprint may suddenly change thus invalidating the license.

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4.3.2.1 Update Installation

To update a existing **DentalSuite** installation two steps are required:

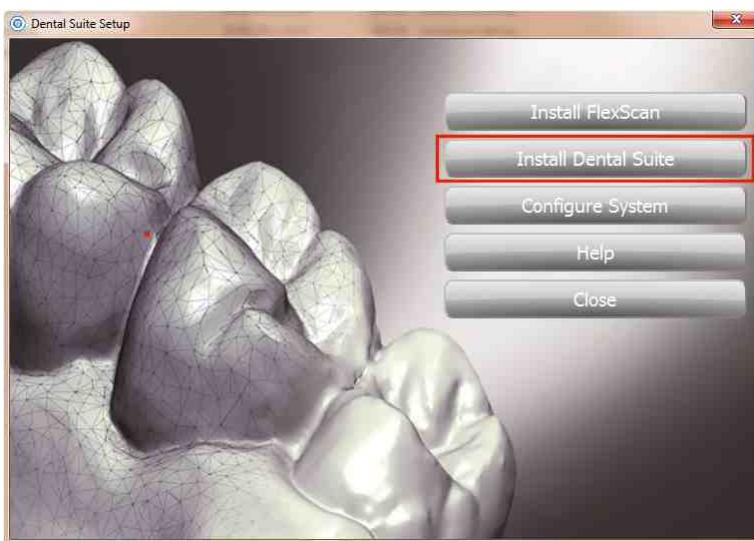
1. Uninstall the previous **DentalSuite** version;
2. Install the new version.

Uninstalling previous versions of DentalSuite

It is highly suggested to uninstall any previous versions of **DentalCAD** to avoid conflicts. To do so use the *Add/Remove Programs* command in the Windows Control Panel.

Install the new DentalSuite Version

To run the **DentalSuite** Installation required just a click on the second button of the *DentalSuite Setup*:



The *DentalSuite Installer* will run. Follow the video instruction keeping all the default proposed by the system.

During the installation the *DentalSuite Setup* asks to overwrite two files:

- C:\Users\{username}\AppData\Roaming\EGS\DentalCAD\ScanManOutput\user_scan_setting.xlm

Answer **No** if you want to keep the previous customization.

Answer **Yes** if you want to discharge any customization and you want to restore factory default.

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4.3.3 Configure System

Configure System Check List

1. To *Configure the System* click on the third button of the **DentalSuite Setup**:



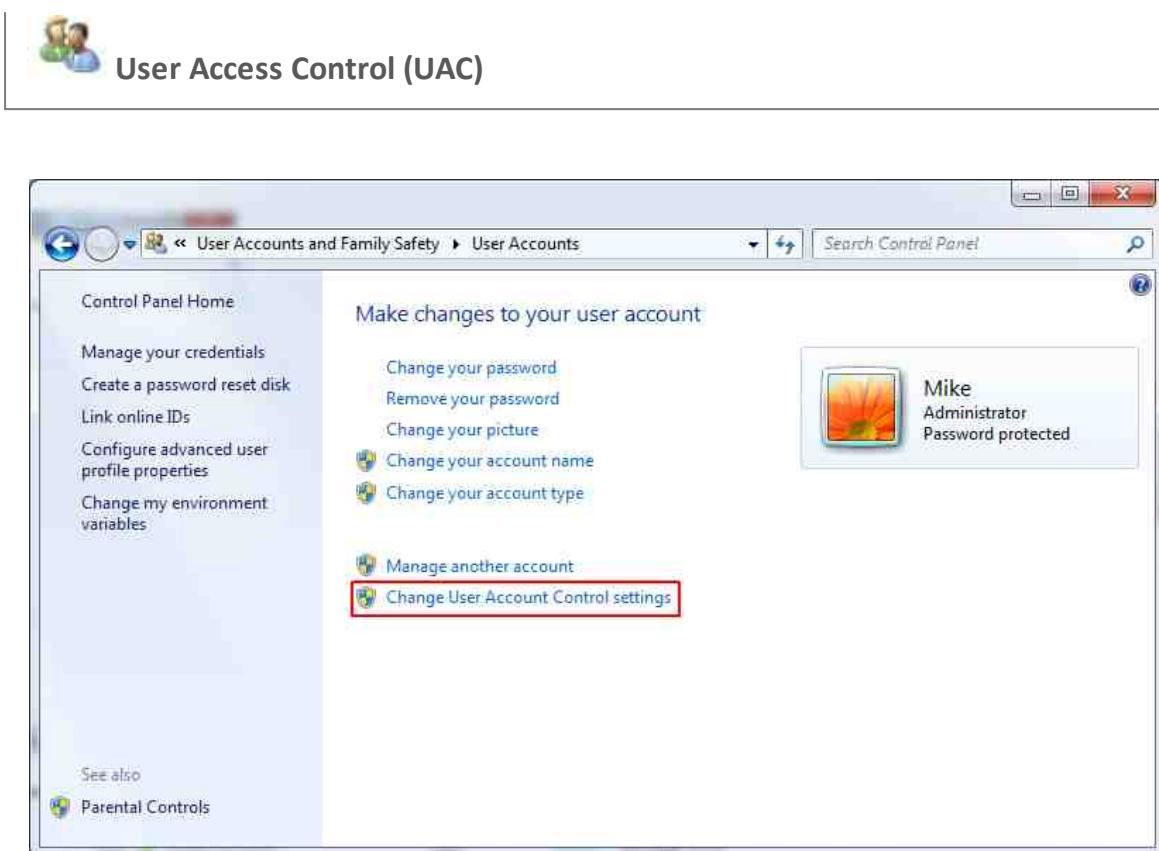
A new dialog box is displayed:

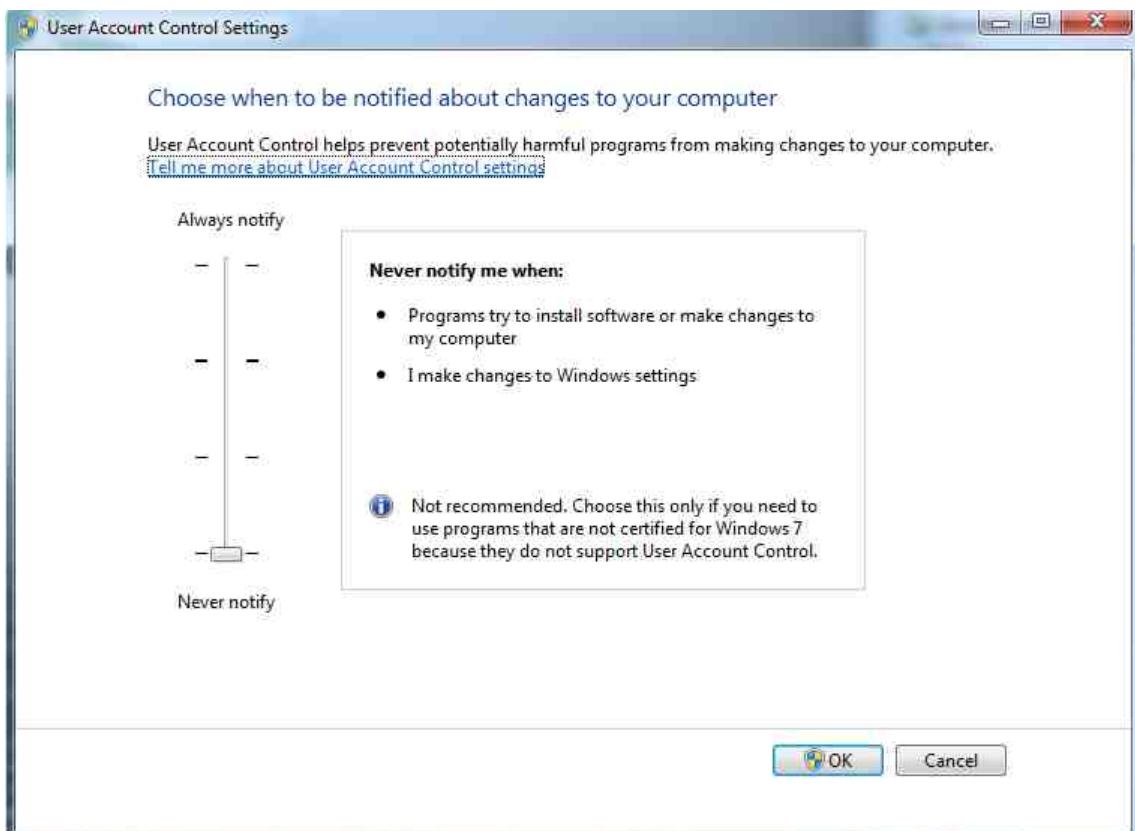


The system is configured correctly if all the items are green.

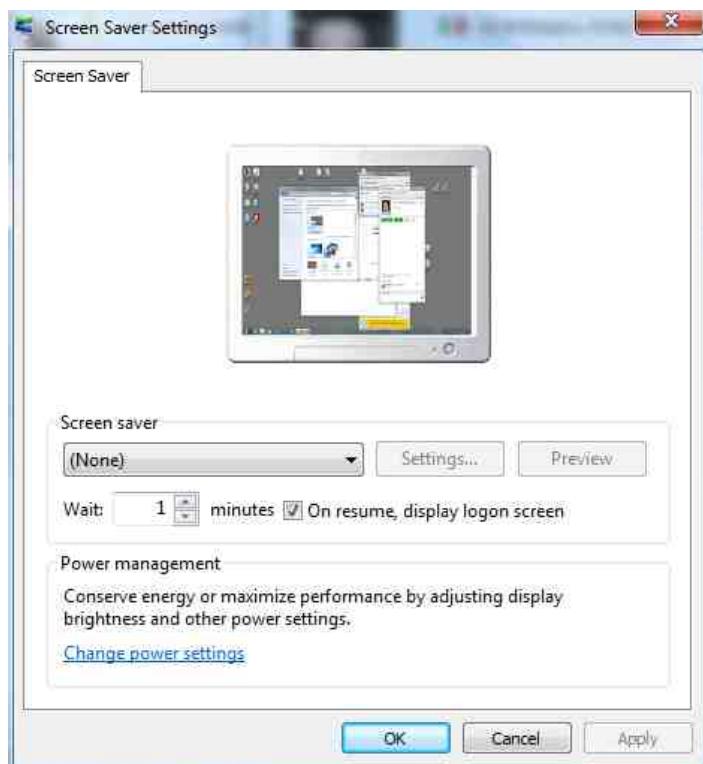
To turn an item from red to green just click on the *change* button and modify the system values according to next paragraph.

At any time, the REFRESH button can be pressed to update the configuration status.



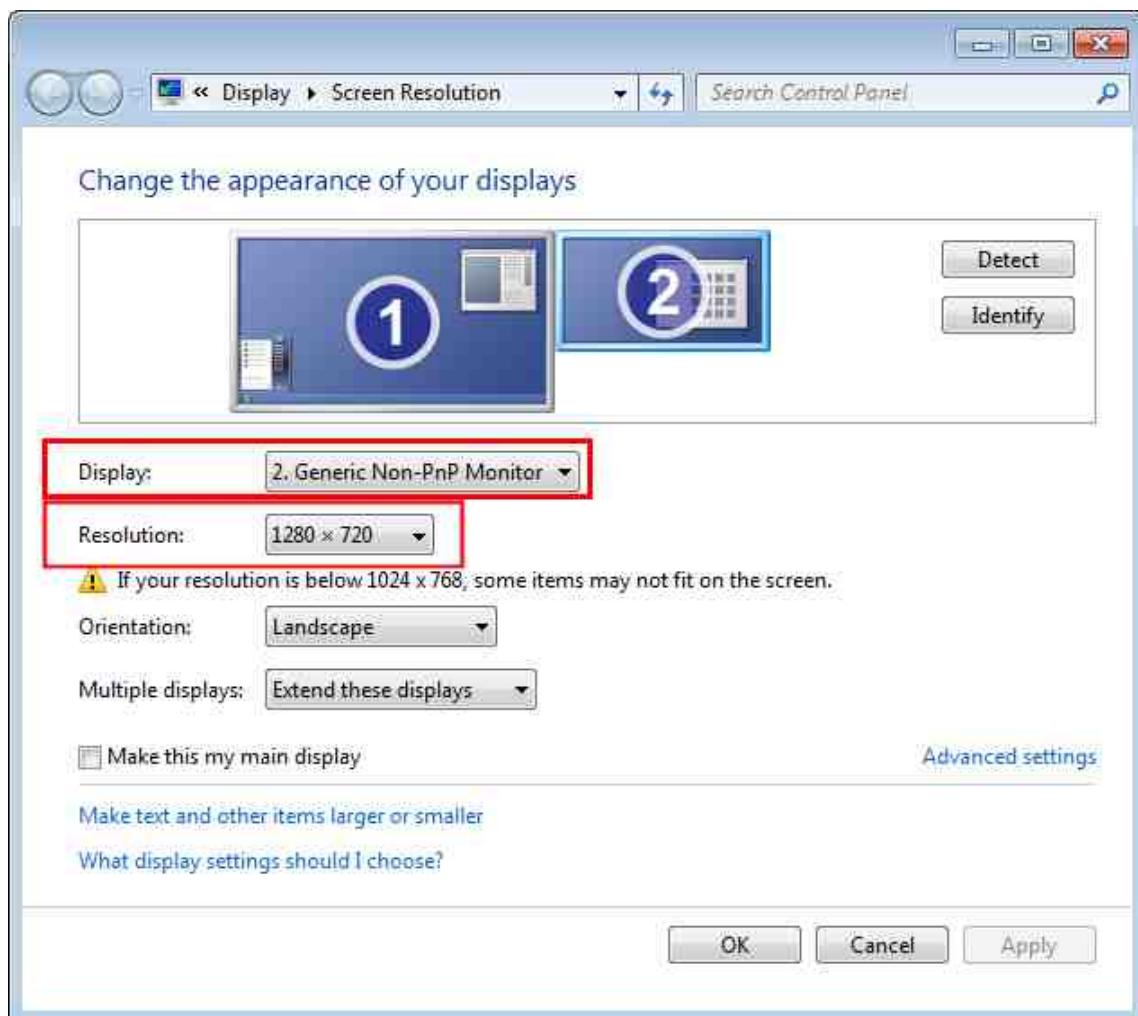


Screen Saver status



Projector Resolution

Select the Display .2 in the menu; the resolution must be set to 1280x720.

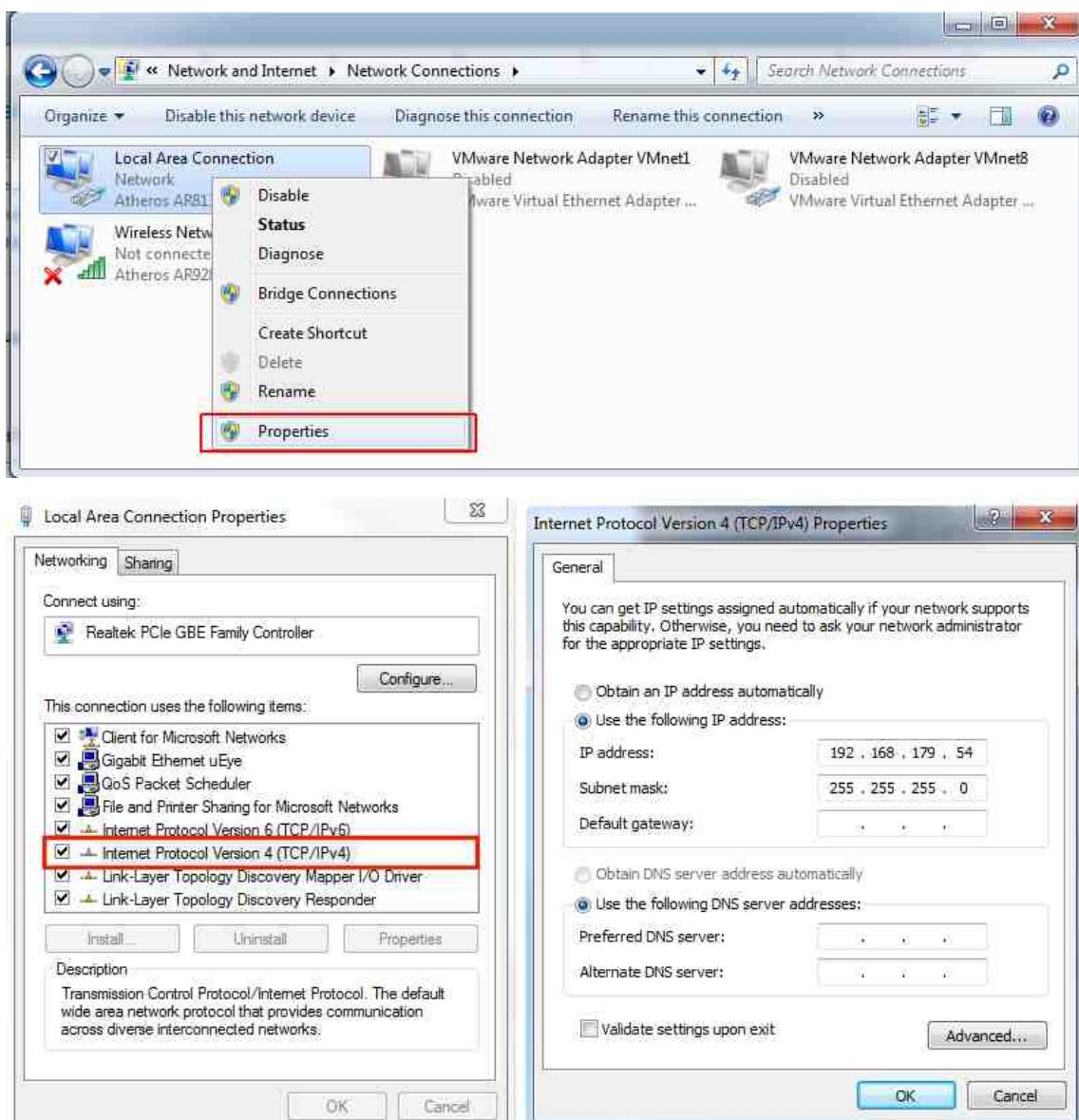


With some configurations, especially laptop based, display resolution **MUST be set in the video card's own driver management.**

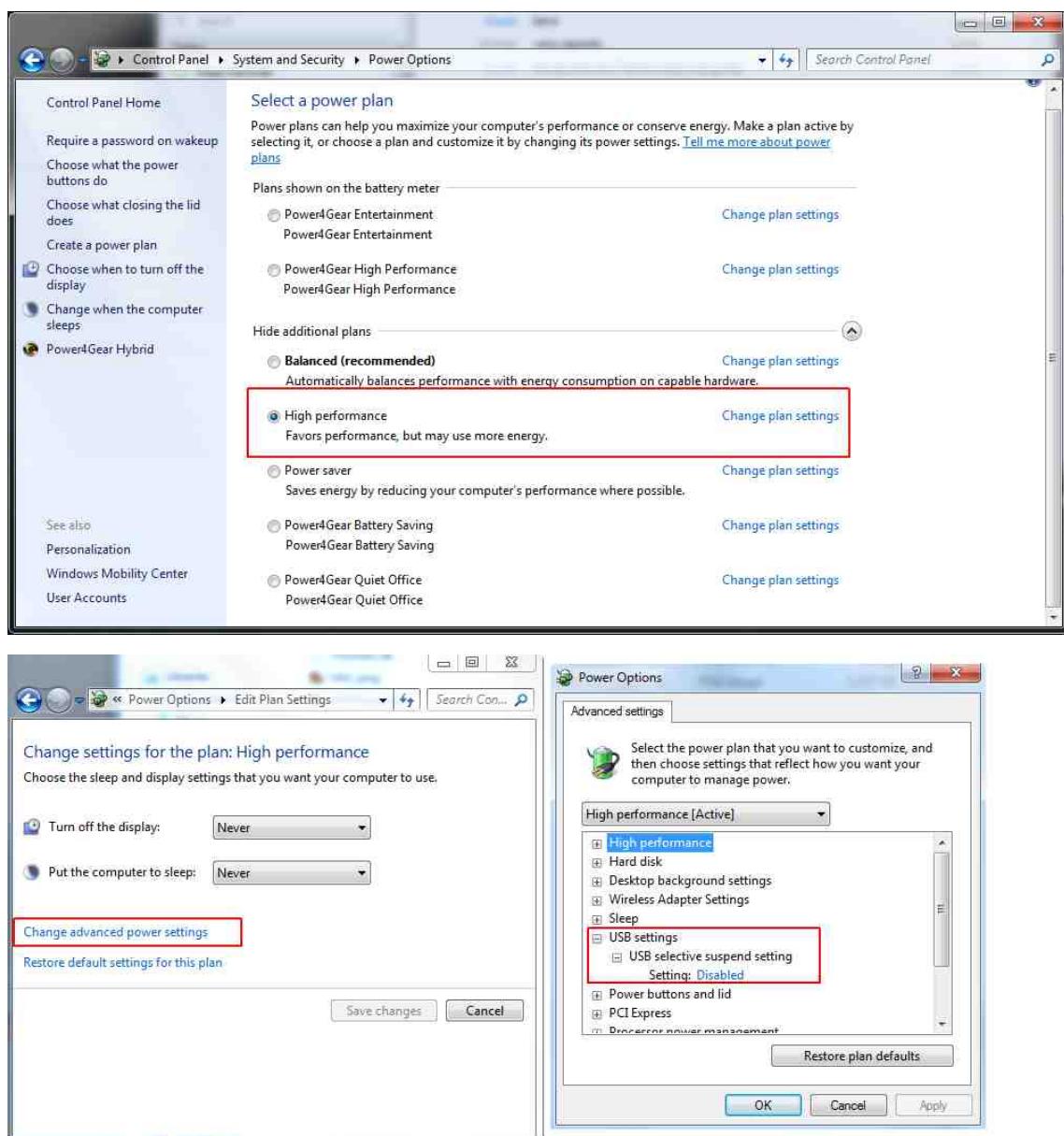


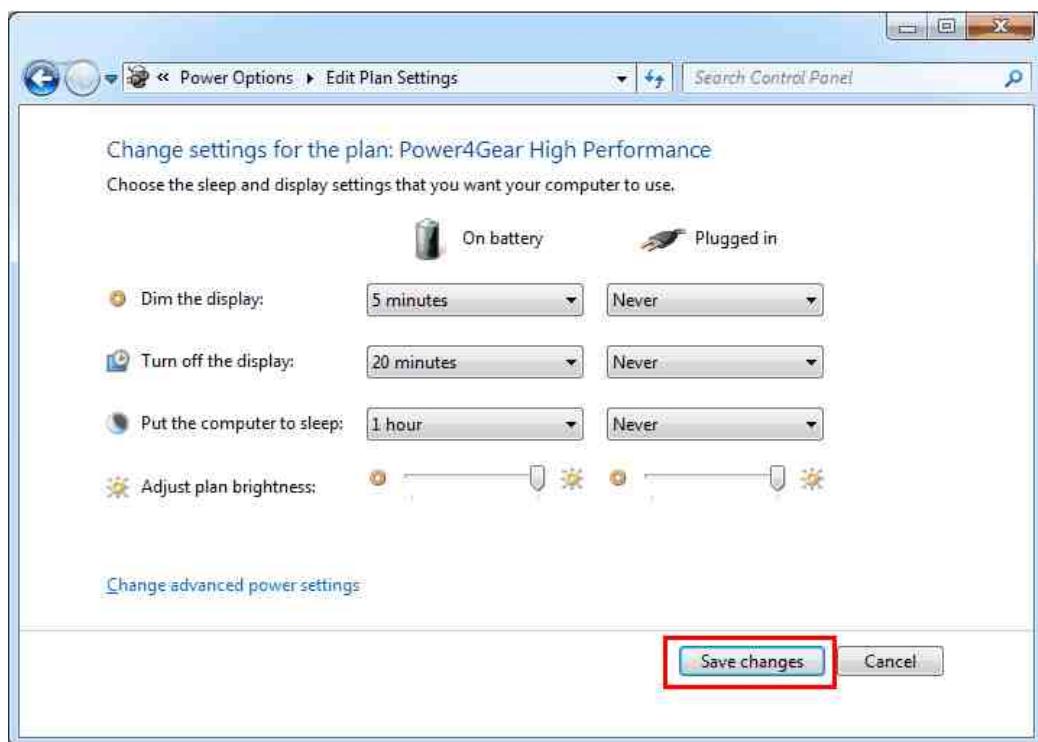
Scanner Network IP

The Ethernet adapter used to connect the PC and the Scanner has to be configured as below:



Power Saving setting





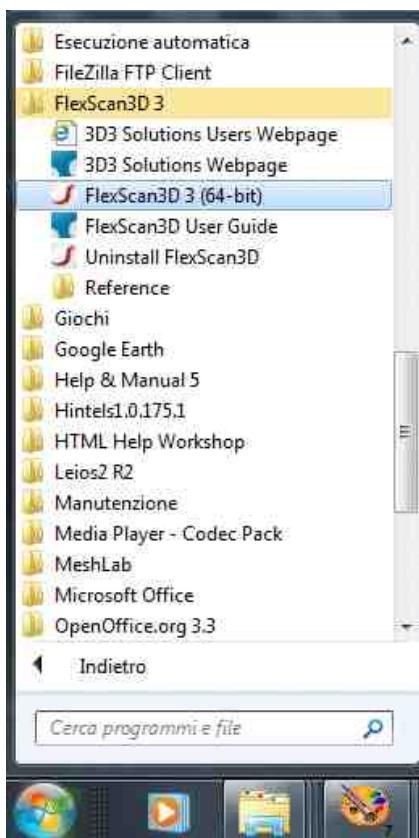
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4.3.3.1 FlexScan

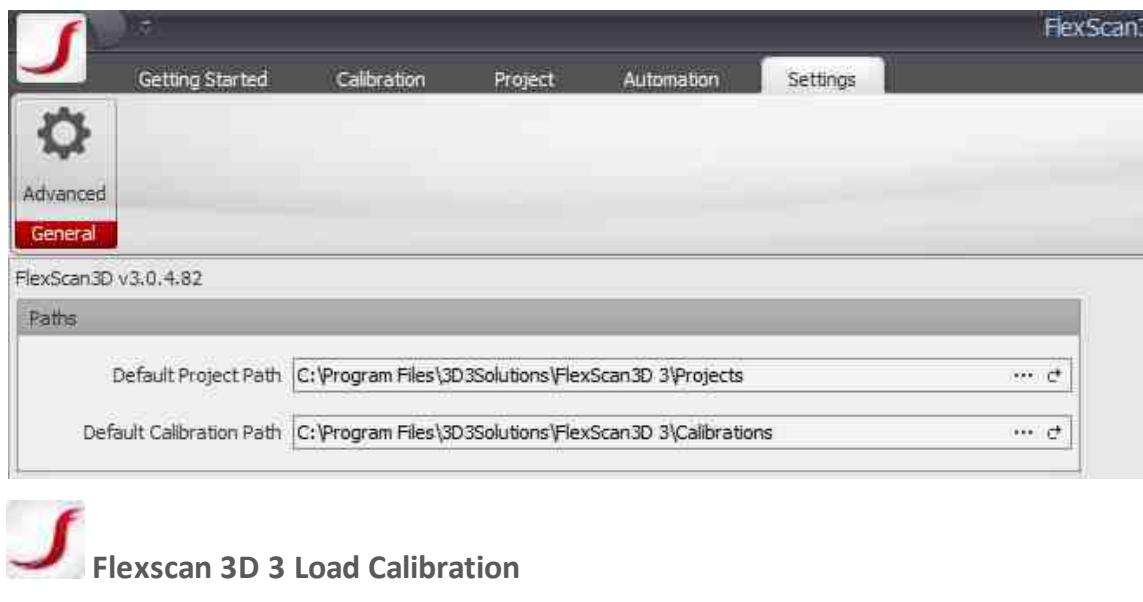
FlexScan 3D 3 Settings should be fixed automatically by the system configuration.

In any moment you can check them inside the application from Start menu or double click on starting icon 

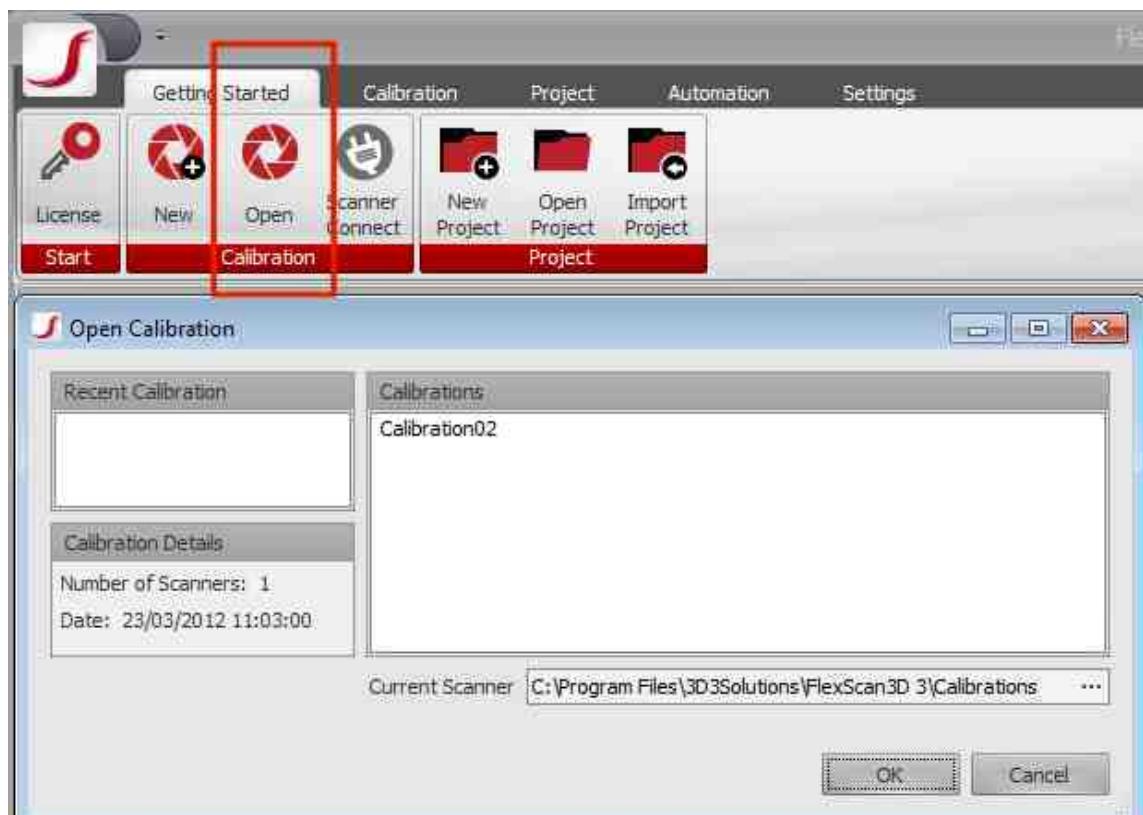


Flexscan 3D Settings

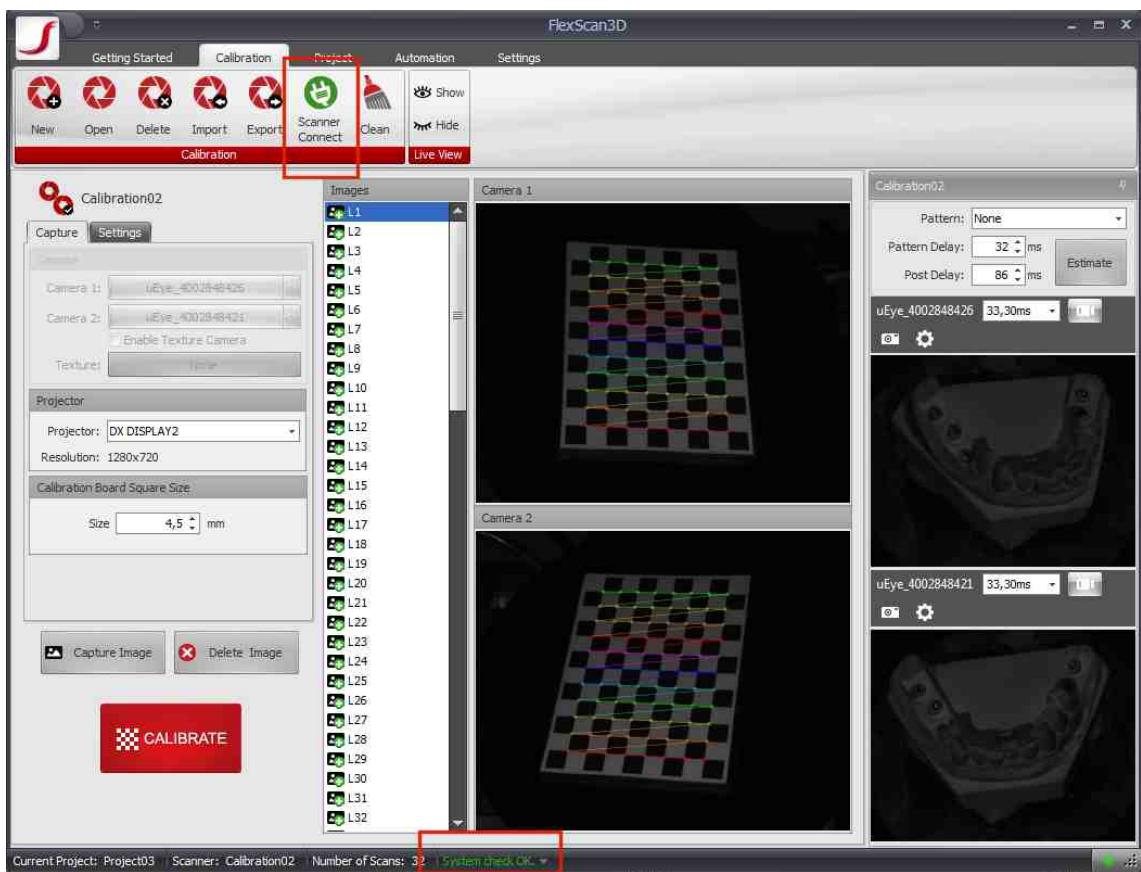
Flexscan 3D folder verification.



Load the Calibration02 and check if it is properly loaded.

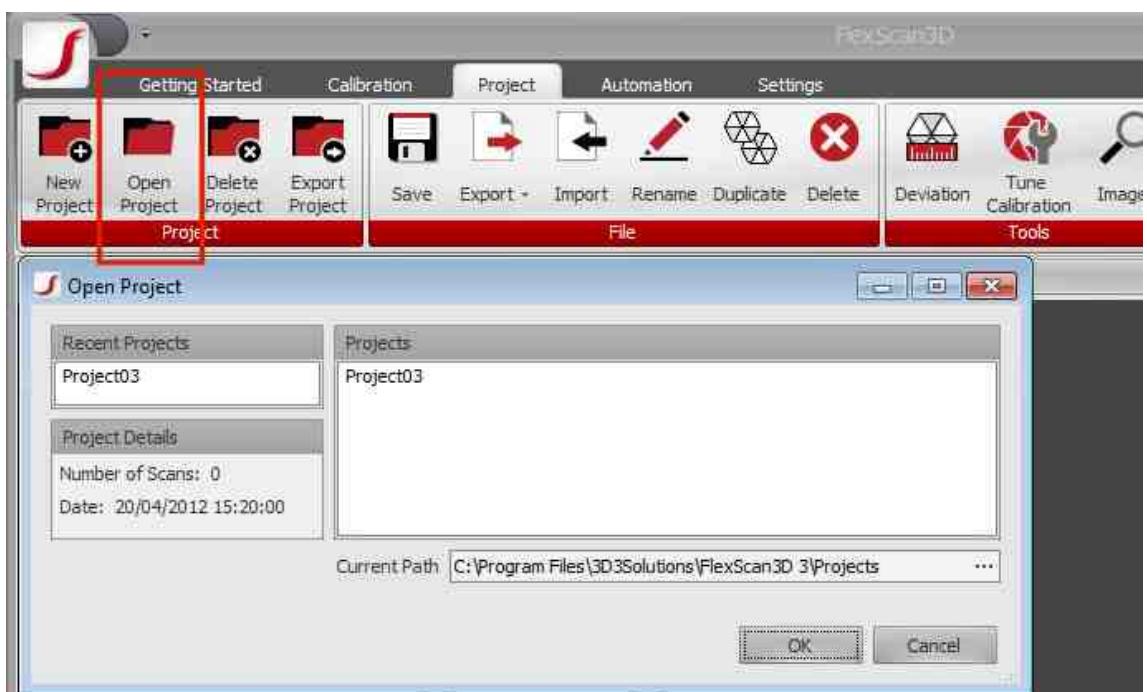


If the Calibration02 is correctly loaded the Scanner Connect button will be green and in the bottom status bar a green "System check: OK" message is showed



Flexscan 3D 3 Load Project

Load the Project03 and check the parameters values.



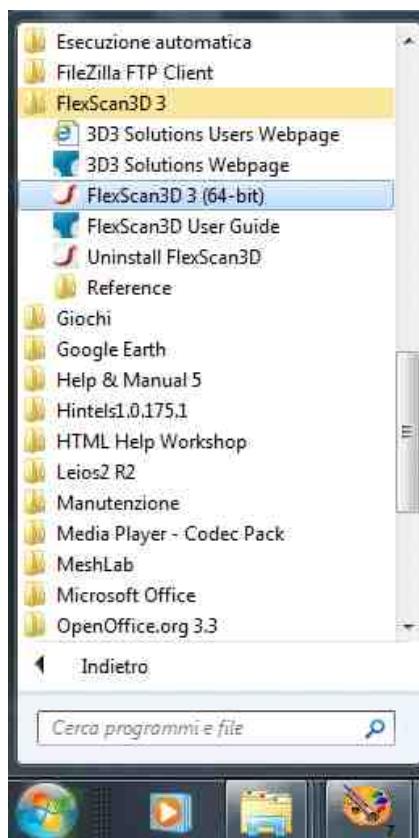
- Threshold [90%]
- Clean up → Aggressive
- Mode → Standard



FlexScan 3D testing

Run FlexScan 3D 3 from Start menu or double click on starting icon

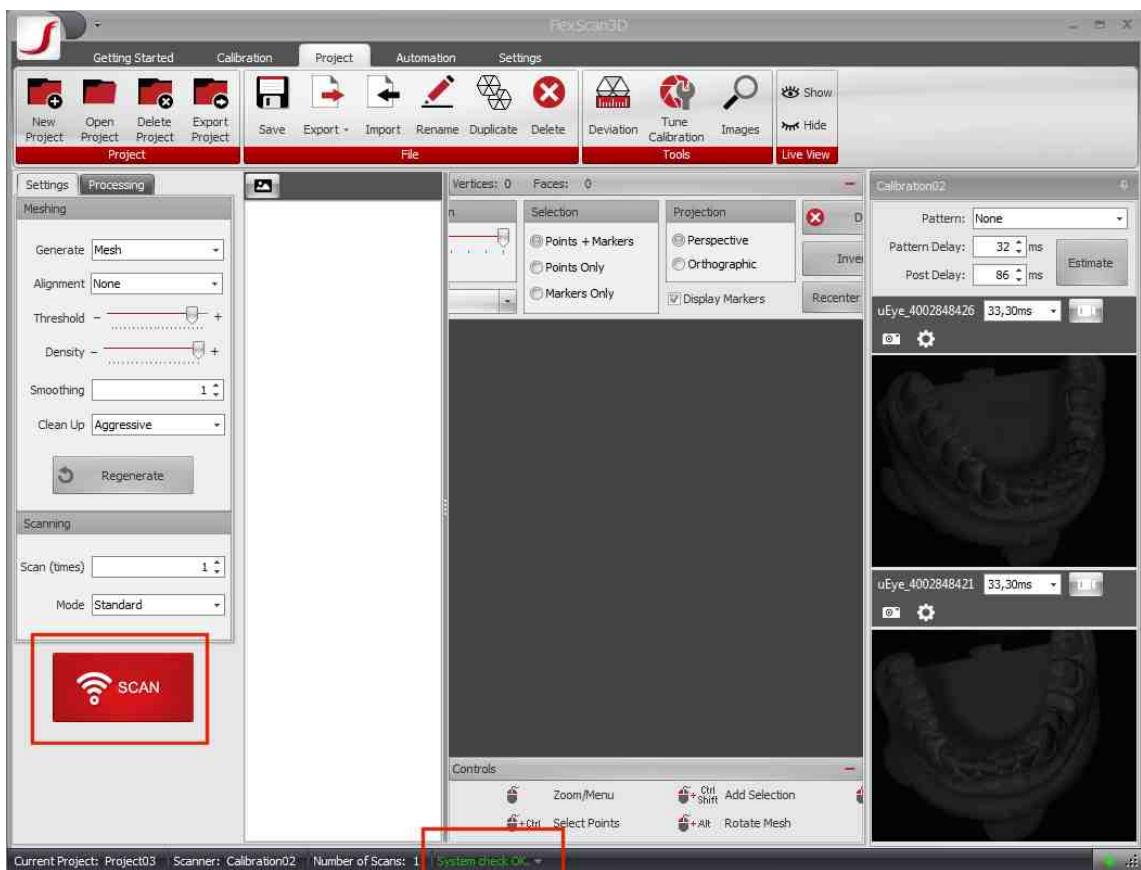




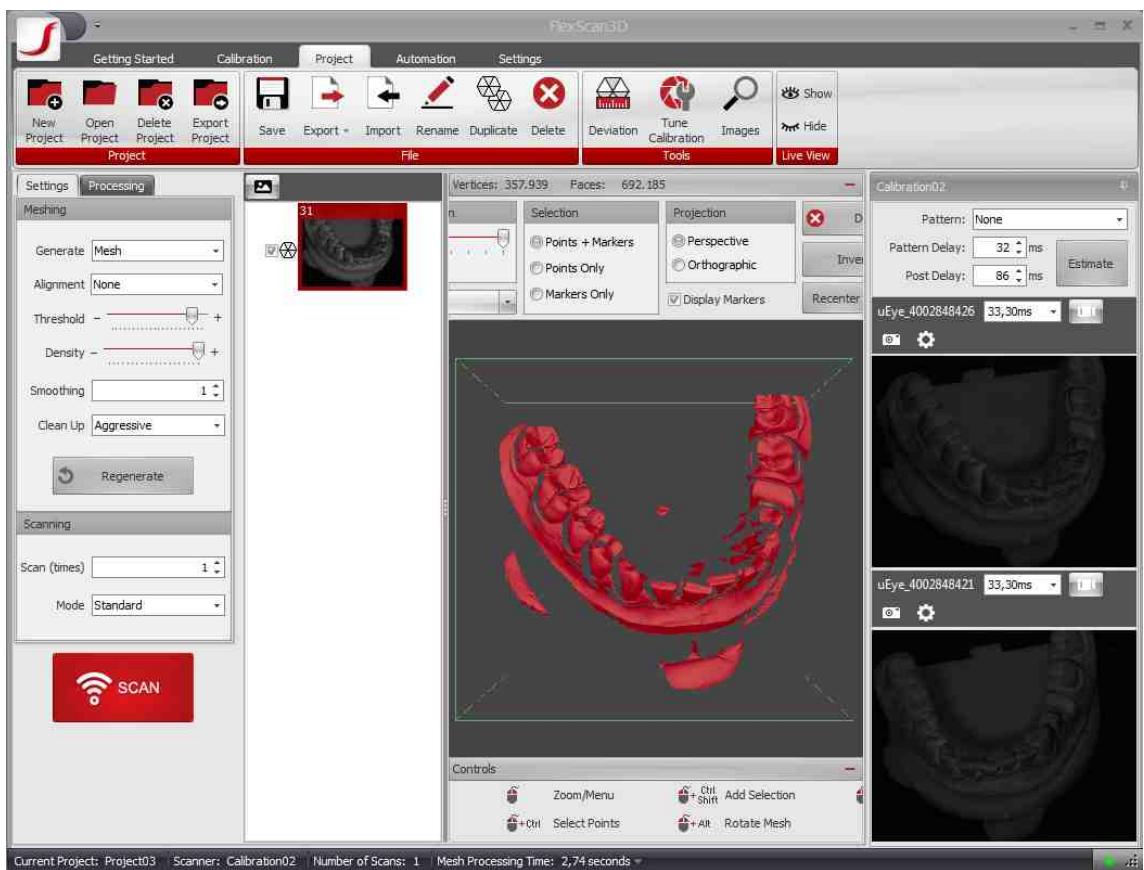
Move to Project menu. Check if:

1. In the bottom status bar a green "System check: OK" message is showed. if not check all Flexscan 3D settings
2. Threshold [90%]
3. Clean up → Aggressive
4. Mode → Standard

Put a model under the Scanner and then press red SCAN button

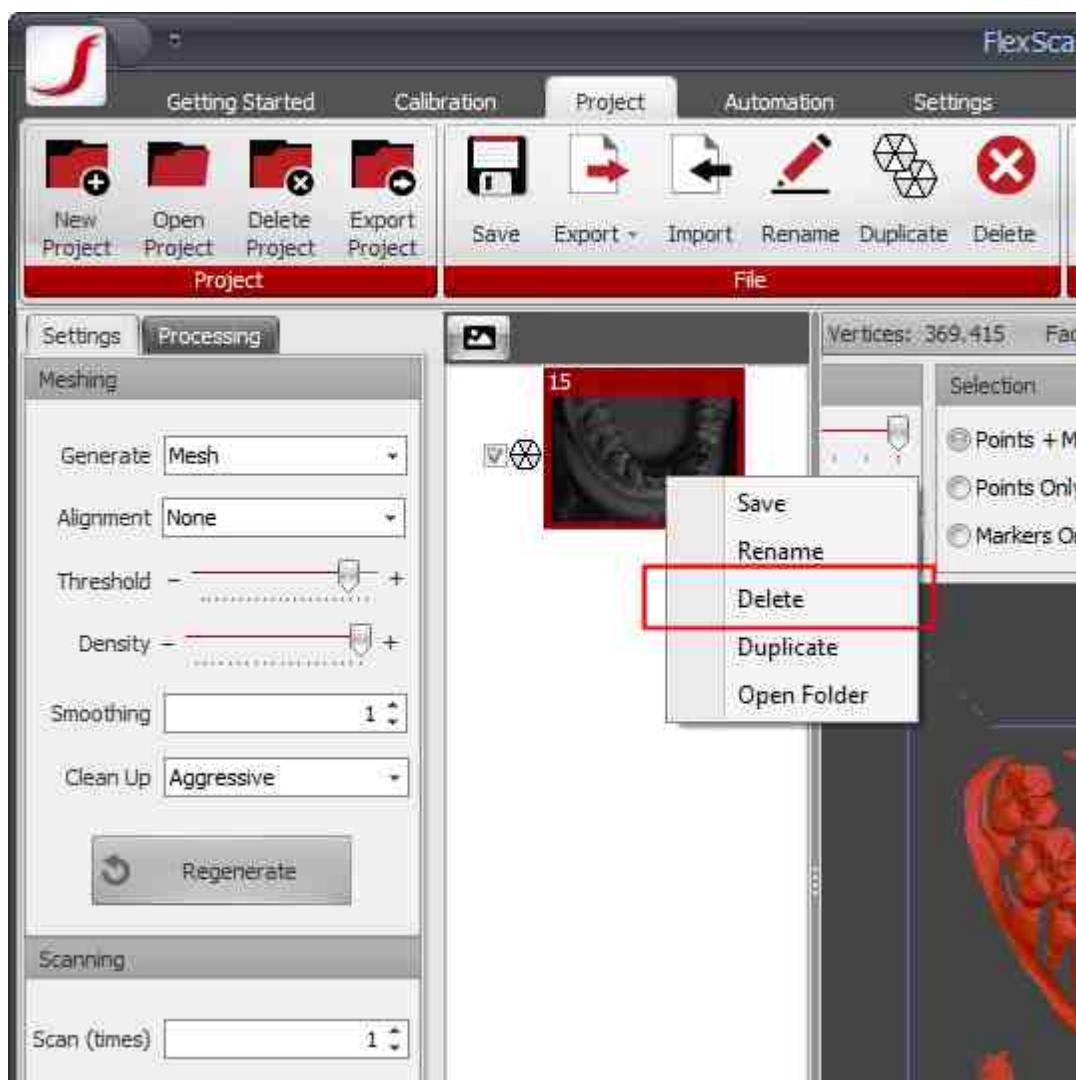


The system acquires points from the model and show them



Before closing the application delete all the acquisitions!

Select them and delete it using context menu



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4.4 Installation Testing

Before running the scanner application for the first time, two mandatory steps have been performed:

1. Perform a Reset Axis
2. Acquire a model in Basic Mode

Flexscan 3D 3 and DentalSuite Licenses have to be activated before proceeding with the installation

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4.4.1 Reset Axes

Reset axes command have to be used every time the scanner stops and the rotary table is not properly oriented.

Warning: Do not insert any model in the Scanner to perform a Reset Axes!

1. Double click on **Dscan** icon ;
2. Select *Basic Scanner Mode*;
3. Click Cancel in the *Basic Mode Scan* dialog box;
4. In the Drop down menu click on **Tool -> Reset Axes**.

In a few second the movable plate start to rotate and tilt. After some rotations it stops automatically properly aligned.

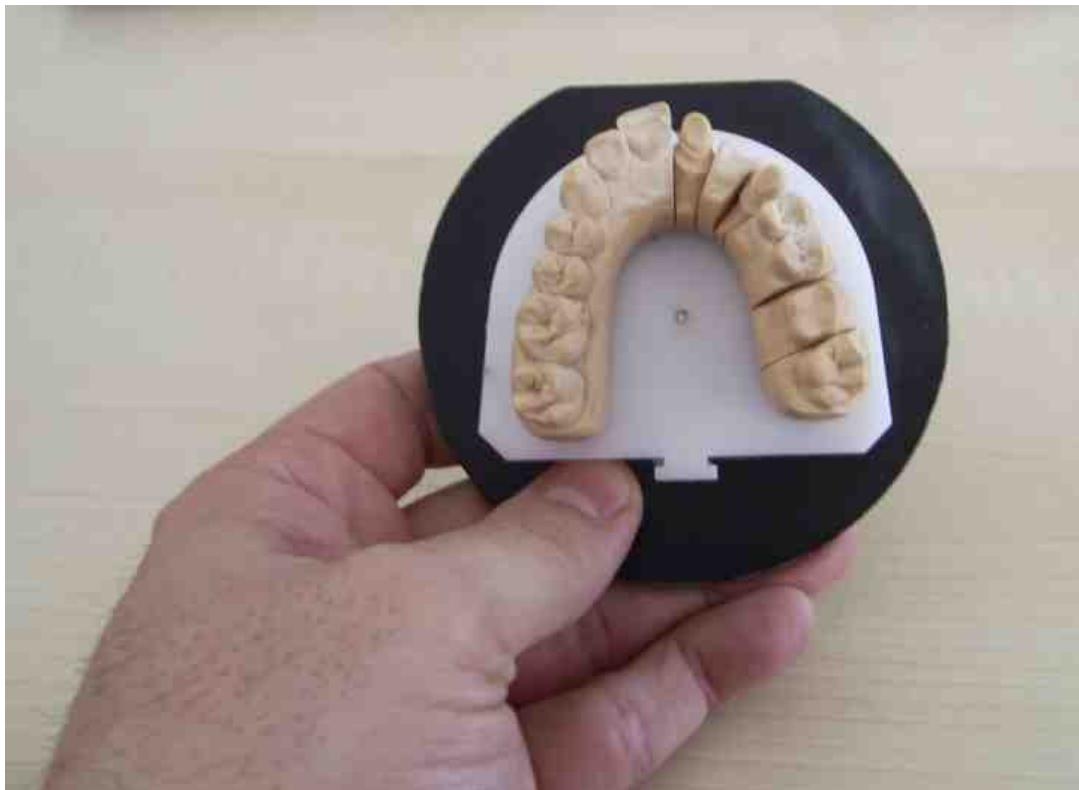
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4.4.2 Basic Mode Scan

The *Basic Mode* is a general purpose acquisition cycle used to test the scanner or to acquire a very simple model. For a more detailed description see Basic Mode.

1. Fix a model on the flat circular plate using Blu Tack adhesive. The incisors teeth have to be oriented as below:



2. Insert the flat circular plate in the scanner, incisors to the back of the scanner



3. Click Green arrow button  in top left corner. The *Scan Dialog* box appears



4. Click on *Scan* button. The scan starts. After the first 3 acquired images points should be visible on the graphic area;

5. When Finalize button becomes active click it to transform points in a mesh;

The Scan can be interrupted using the red square button: . If you stop the Scanner the movable plate will be moved to zero position automatically.

4.5 Troubleshooting

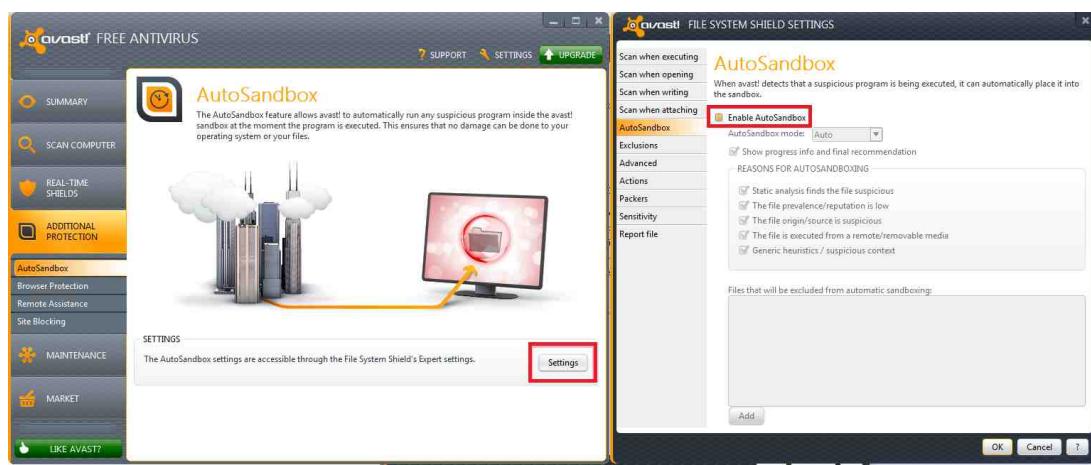
4.5.1 Antivirus

DentalCAD setup system automatically installs certificate to license software components.

This is done via a batch script, which can be identified by some protection software as malicious, or unsafe.

At the time of writing, known issues include the following anti-virus software:

- **Avast v.7 and above:** make sure to disable "auto sandbox" function to correctly install the license.



auto-sandbox must be DISABLED for correct licensing of DentalCAD

5 DScan User's Guide

Dscan can run in two main ways:

1. Basic Mode
2. Job Driven Mode
 1. Loading manually a Job Definition file
 2. Invoked automatically from a CAD application

5.1 Basic Mode

Basic Mode is simple way to run the scanner in order to scan a model without defining a specific strategy. It is possible to acquire model not related to dental application.

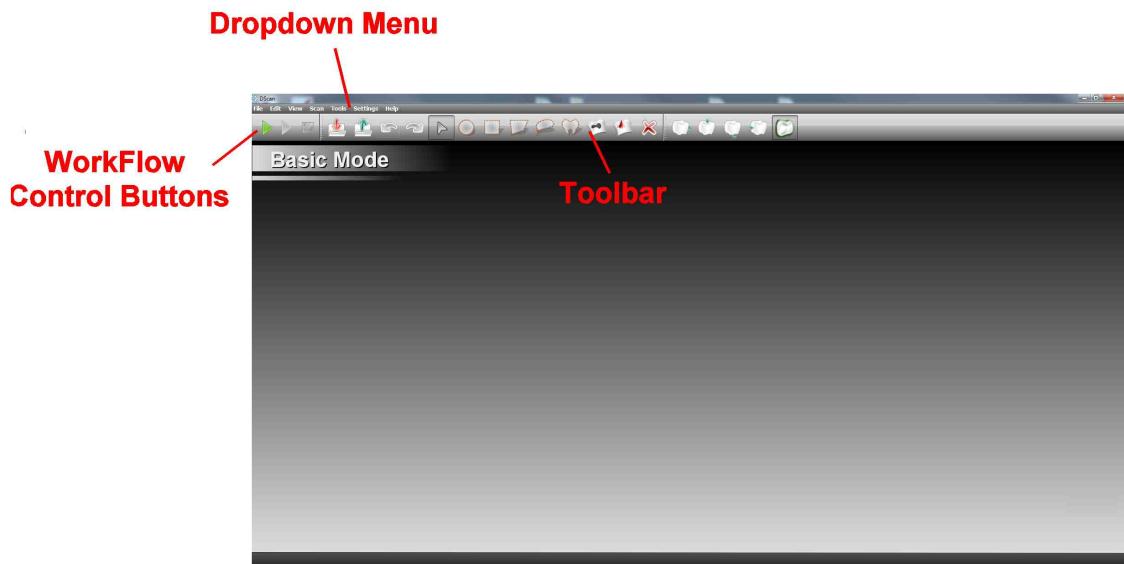


By default a 16 positions cycles is used but this can be changed depending from the complexity of the object to acquire.



5.1.1 UI Elements

Basic Mode general UI layout is showed below:



UI Elements include:

- Workflow Control Buttons
- Toolbar Commands

5.1.1.1 Workflow Control Buttons

Top Left there is the Workflow buttons toolbar



Actions Buttons

When active (Green) a Scan Step will be executed



When active (Red) a Scan Step is running. Using this button it is possible to stop the Scanner. It immediately stops to acquire data and returns in zero axis position



When active (Yellow) a Finalize computation is performed. Points acquired by the scanner become meshes



5.1.1.2 Toolbar Commands

In the following, for each command of the toolbar, from left to right, a brief description is provided.



5.1.1.2.1 Import Files



An Open file dialog pop up allowing the user to load multiple STL files in the scanner

5.1.1.2.2 Export Files



An Export Files dialog pop up allowing the user to export multiple STL files from the scanner

5.1.1.2.3 Undo/Redo



Undoes or Redoes last operation

5.1.1.2.4 Mesh Selectors

-  Disabled selection: Switch to this tool when you want to simply navigate on model without any active selector
-  Point selection: allows to select all the triangles inside a small circular region
-  Rectangle selection: allows to select all triangles inside a rectangular region
-  Polygon selection: allows to select all triangles inside a polygonal region
-  Lazo selection: allows to select all triangles inside a free-hand closed region
-  Cluster selection: selects all triangles in the picked cluster

5.1.1.2.5 Fill holes



Fills the holes in the mesh

5.1.1.2.6 Spike Removal



Flatten the triangles in a small area defined by polygon selection

5.1.1.2.7 Delete Selected triangles



Removes all the selected triangles

5.1.1.2.8 Standard Views



Sets the viewport to a standard direction

5.1.1.2.9 Show/Hide Mesh Borders



Graphical display option for showing or not the borders of the mesh in highlight

5.2 Job Driven Mode

Upon starting the Scanner prompts the user to choose the acquisition Options and the scanning Strategy to use



Three Strategies are available:

- Inplace: Standard strategy. The job stumps stay in the original position during scanning. No realign is required
- Multidie: Alternate strategy. The job stumps are positioned on a special device. They need to be realigned manually later

- Fast Coping: it is particularly useful when a single Stump has to be scanned

The below Options allows the user to add elements to scan:

- Gum
- Waxup
- Antagonist

Workarea definition flag force the scanner to focus on a specific arc jaw area avoiding to acquire the entire model saving computational time

5.2.1 Acquisition Workflow

Depending from the strategy and option selected, the **Dscan** sets several Steps in order to acquire the arc jaw model and related stump in the best possible way. This sets of Steps are called **Acquisition Workflow**. To help the user to navigate in the workflow a wizard like UI is provided. There are three type of Steps used by scanner to make an Acquisition Workflow:

1. **Scan Step:** The model is scanned using several positions depending from the specific Step. After a Finalize meshes are created. Obviously an arc jaw, a tooth or other models have to be inserted in the scanner by the user
2. **Registration Step:** Meshes are aligned each other. The alignment requires to select three points on a fixed mesh and the homologous ones on a movable mesh. The application compute the transformation in order to minimize the distances. In order to align to mesh they have to have overlapping areas. It is not possible to align meshes without overlapping
3. **Assignment Step:** Meshes are segmented and assigned to the appropriate teeth

For example below are listed the Steps to acquire a simple job using Inplace strategy and Workarea flag on. No additional options selected

1. Workarea Definition
2. Total Model Acquisition
3. Neighbors
4. Inplace
5. Registration
6. Finish

The same Workflow adding Gum Option:

1. Workarea Definition
2. Total Gum Acquisition
3. Total Model Acquisition
4. Gum Registration
5. Gum
6. Neighbors

7. Inplace
8. Registration
9. Finish

In the following sections Steps are described in details

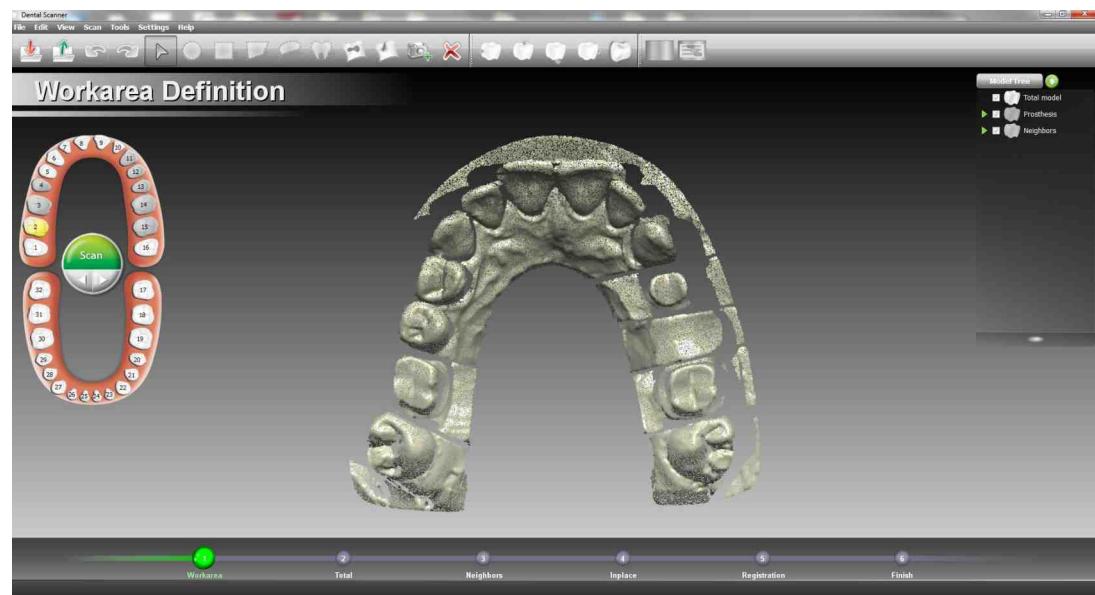
5.2.1.1 Workarea Definition

The Workarea Definition is a Scan Step. It has the goal to focus all the scanning and computation effort to a specific arc jaw area avoiding to acquire the entire model saving time

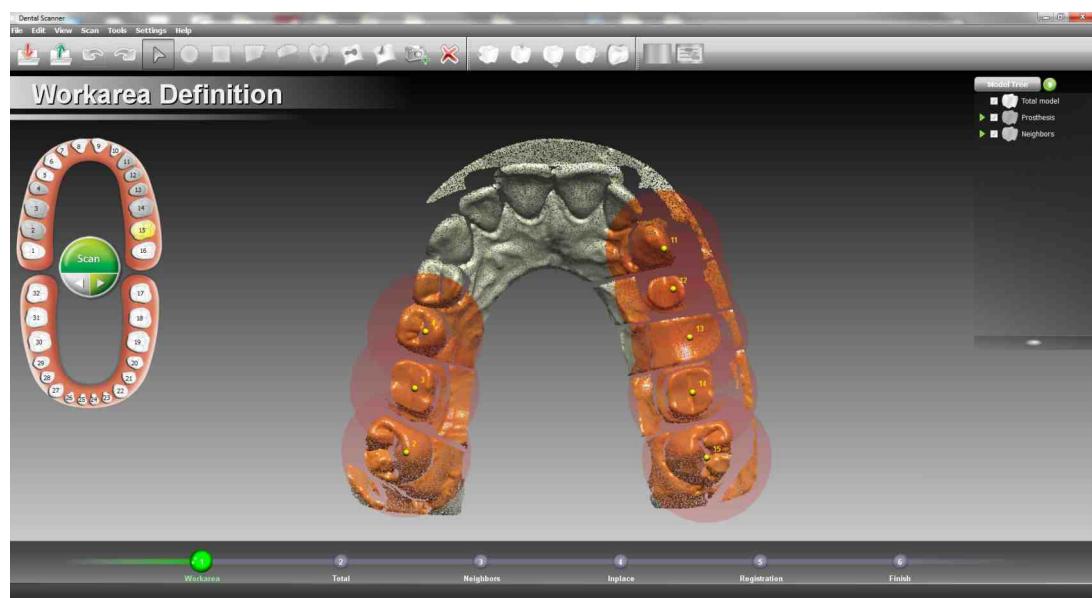


Workarea Definition

1. Quick acquisition, only 2 positions by default, of the total model is done. No Finalize is required



2. Teeth segmentation and linking. When all the teeth are linked to a workarea, the step is completed. In this step the top view is blocked, and only panning is allowed.



5.2.1.2 Total Model Acquisition

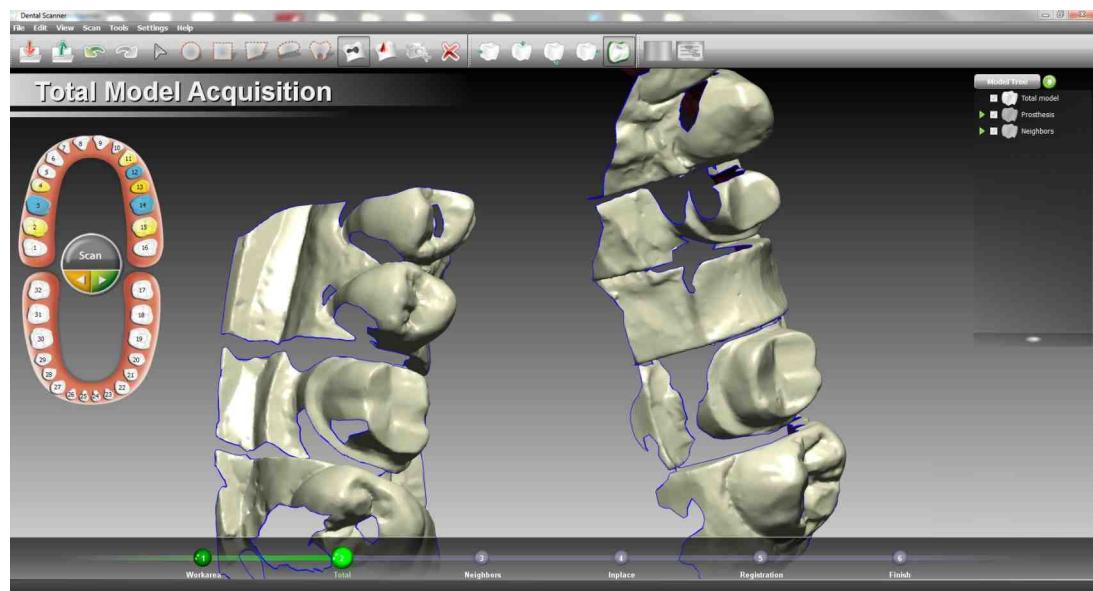
The Total Model acquisition is a Scan Step. It is used for two purposes:

1. Neighbors and Pontic element definition
2. Reference for other acquisition Steps



Total Model Acquisition

1. Detailed acquisition, 8 positions by default, of the previously defined workarea. To finish the acquisition a Finalize is required



2. Upon completion of the acquisition it's possible to use the Fill Holes or Spike removal tool to heal the mesh. When no further editing is needed, the step is completed



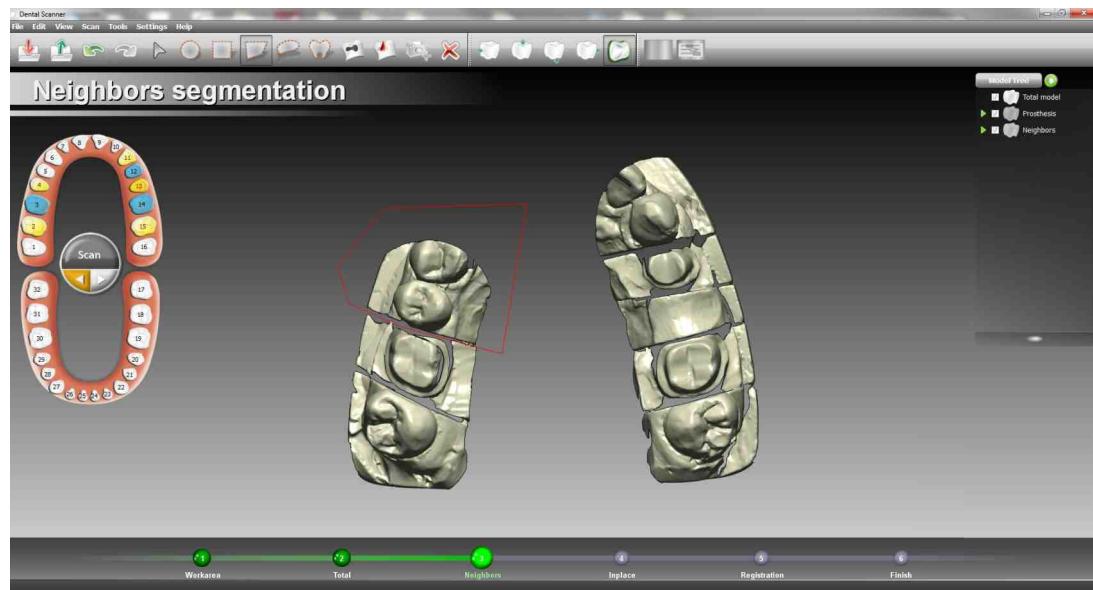
5.2.1.3 Neighbors

Neighbors is an Assignment Step. A manual segmentation is needed to identify all the neighbors and pontic elements in the Total Model acquisition.

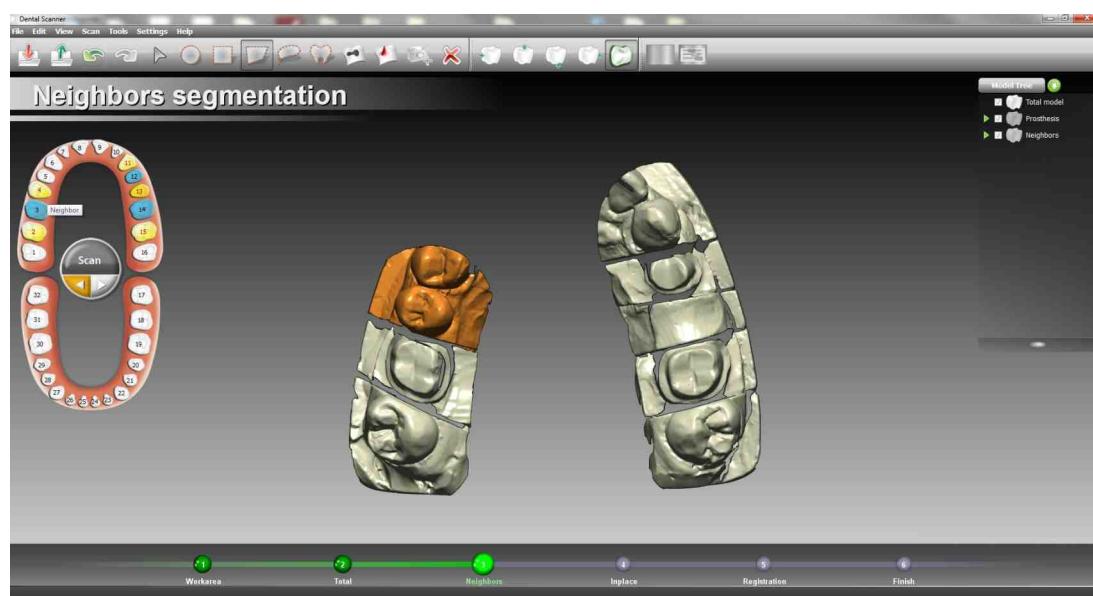
This step is usually performed using the polygon and the lasso selection tools.

Neighbors segmentation

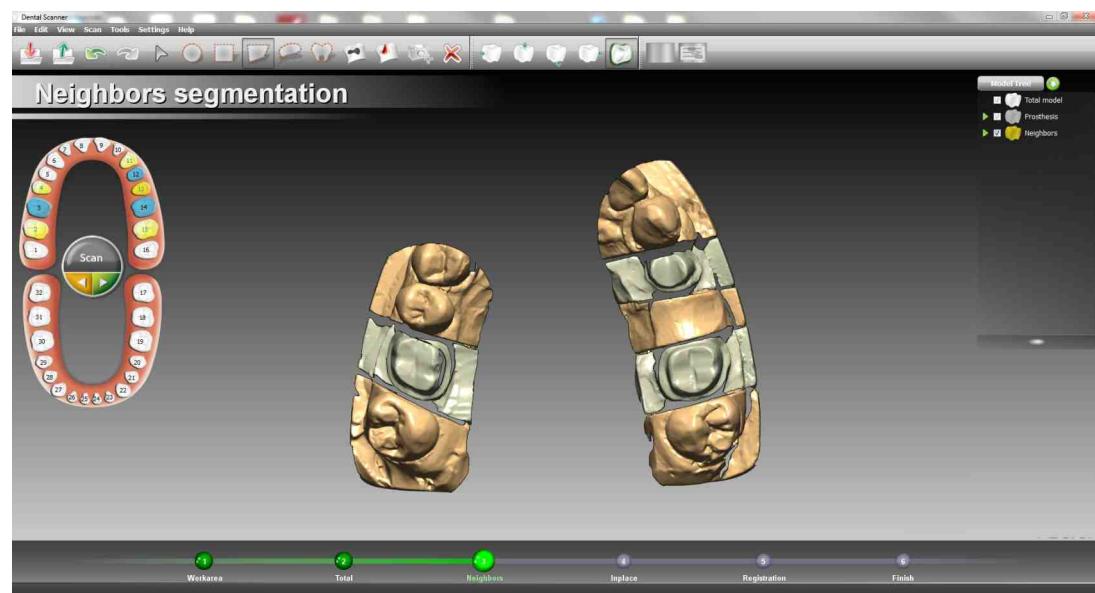
1. Correct manual segmentation of the single meshes:



2. Linking of the segmented meshes to the preparation elements; pick the segment and the arcjaw teeth by single click to link;



3. Correctly linked elements are shown in pale orange; unlinked elements are shown in bright orange. Once all elements have been correctly linked the step is complete.



5.2.1.4 Inplace

Inplace

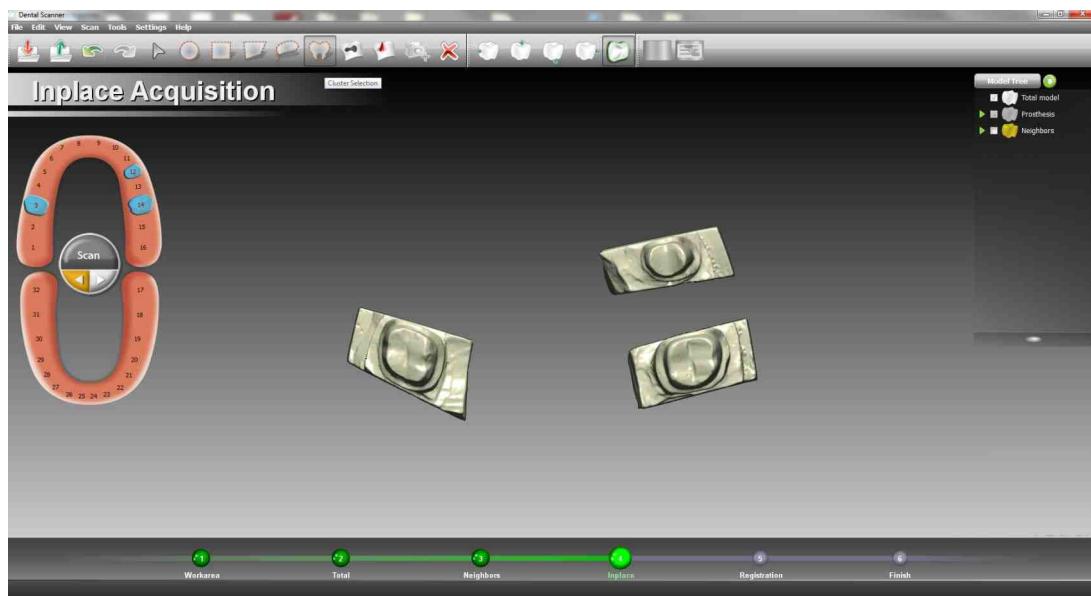
The Inplace is a Scan Step. This strategy implies keeping the stumps on the base, while removing all the other elements. Stumps scanned this way are already in the right position, no additional step are required



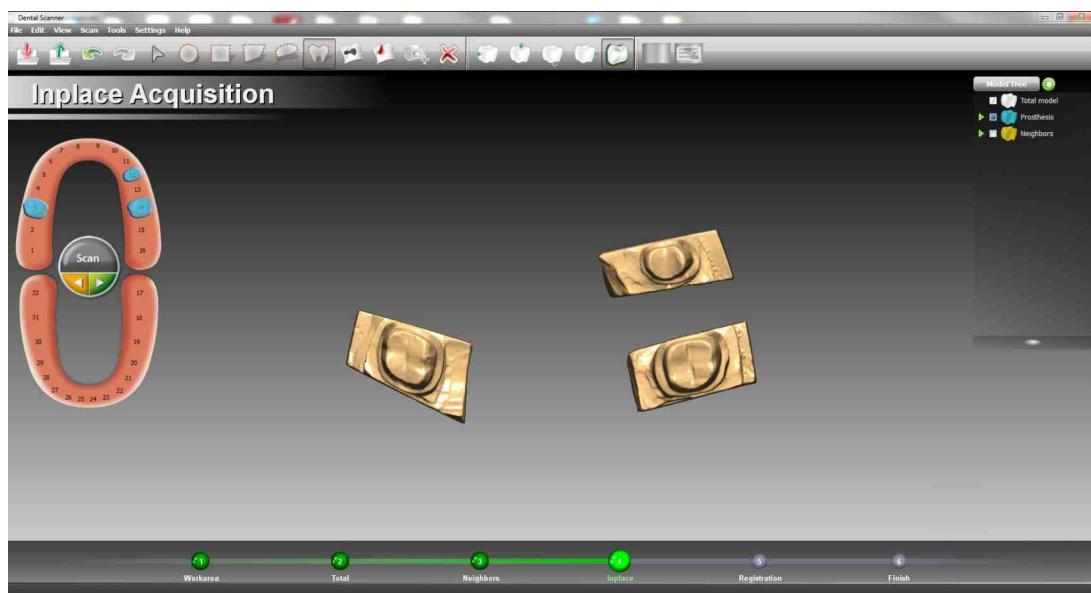
If the preparation involves several stumps the scanner automatically could split the acquisition in two or more separate Steps

Inplace workflow

1. Acquire the stumps, 16 positions by default. A Finalize is required. Elements scanned this way are already registered with the total acquisition:



2. Link the elements; pick the segment and the arcjaw teeth by single click to link



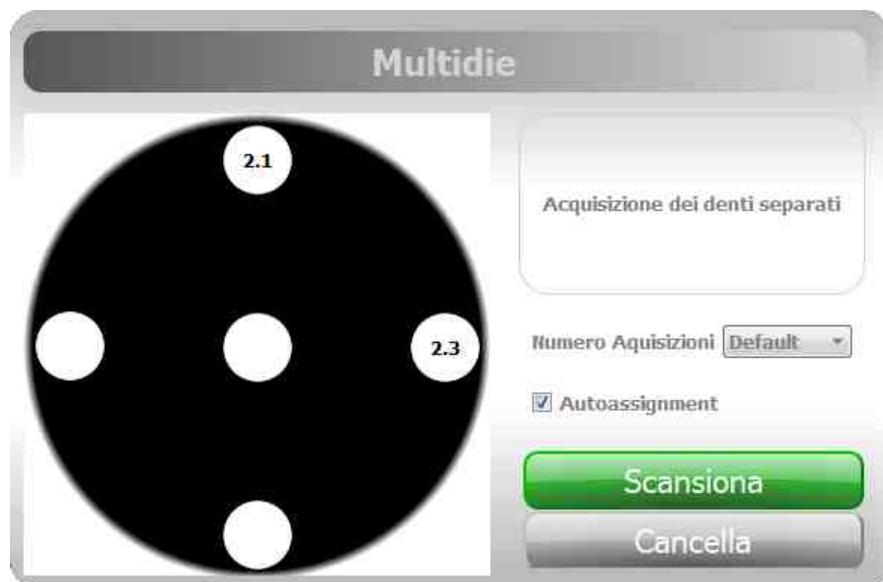
If one tooth is not well acquired don't assign it. Remove from the base the right ones and repeat the scan running it from pulldown menu. (The Scan button is inactive)

Dscan deletes automatically the not assigned mesh and repeat the acquisition cycle

5.2.1.5 Multidie

Multidie

Multidie is a Scan Step. This strategy implies removing the stumps from the base and inserting them into a special tablet, according to a specific pattern. The stumps are scanned in a different position respect the arc jaw, an additional registration step is required and mandatory to move them in the right position. As reference the Total Model is used



If the preparation involves more than five stumps the scanner automatically split the acquisition in two or more separate Steps

Multidie workflow

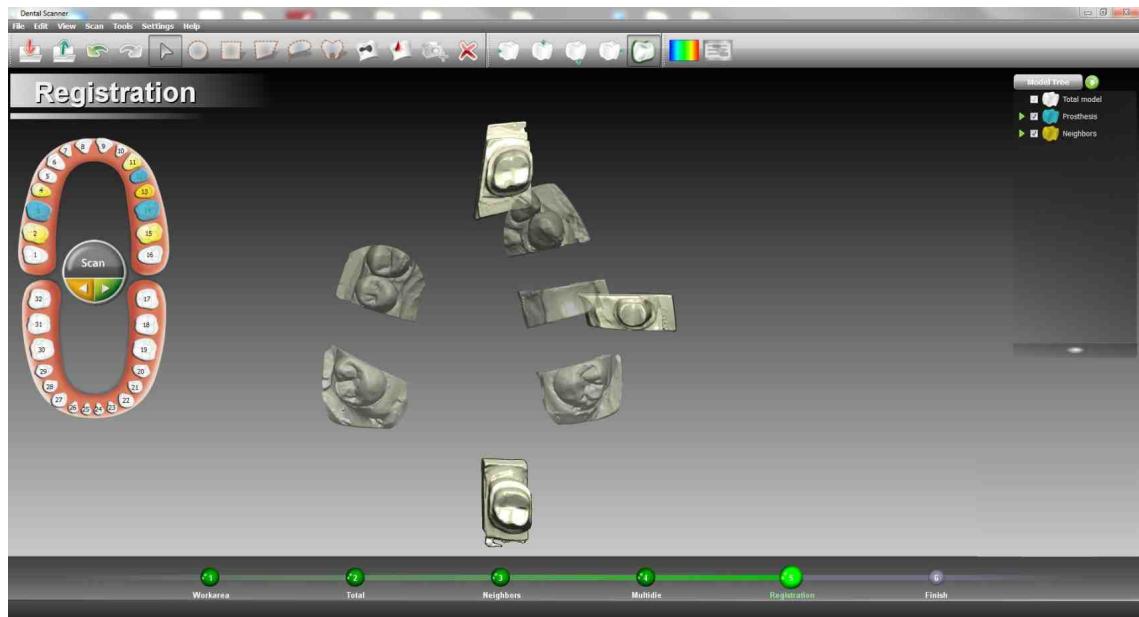
1. Acquire the multidie support, 16 positions by default. A Finalize is required to finish. The meshes are assigned automatically by **DScan** if the flag Autoassignment is on



If one tooth is not well acquired deassign it clicking on the related arc jaw icon. Remove from the rotating tablet of the scanner the right ones, move just a little the wrong stump and repeat the scan running it from pulldown menu. (The Scan button is inactive). When the multidie scan dialog box appears unflag the Autoassignment. **Dscan** deletes automatically the not assigned mesh and repeat the acquisition cycle

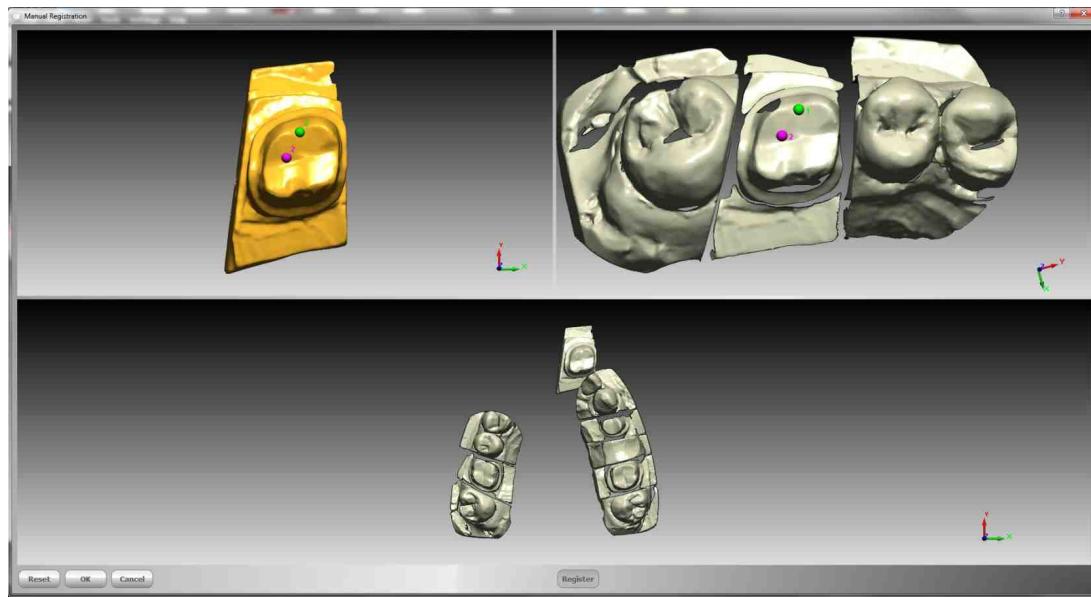
5.2.1.6 Registration

Registration has the goal to align meshes to other one. Usually stumps or waxup are aligned using Total Model. Registration Step is mandatory for stumps acquired using the Multidie approach, and optional for Inplace acquisition.



Registration

1. Click in the arc jaw on the tooth to register: A dialog box appears
2. Select three or more homologous points on both the single teeth and the total model. At any time is possible to RESET the selection or ABORT the operation. Once done click the REGISTER button



3. By clicking the OK button the operation is completed. A successfully registered element is shown with a green label in the jaw view:



4. Repeat the step for each element to align

5.2.1.7 Finish

When all the Steps in the Acquisition Workflow are done, the scanning process is complete. The Scanner application is ready to move all the data acquired to the Modeling Prosthesis phase. This is automatically done clicking on the NEXT button



5.2.1.8 Gum

When Gum option is checked the Scanner add three Steps to the Acquisition Workflow:

1. Total Gum Model Acquisition
2. Gum Registration
3. Gum Assignment

Total Gum Model Acquisition

Total Model with gum is acquired, 8 positions by default. A Finalize is required



Gum Registration

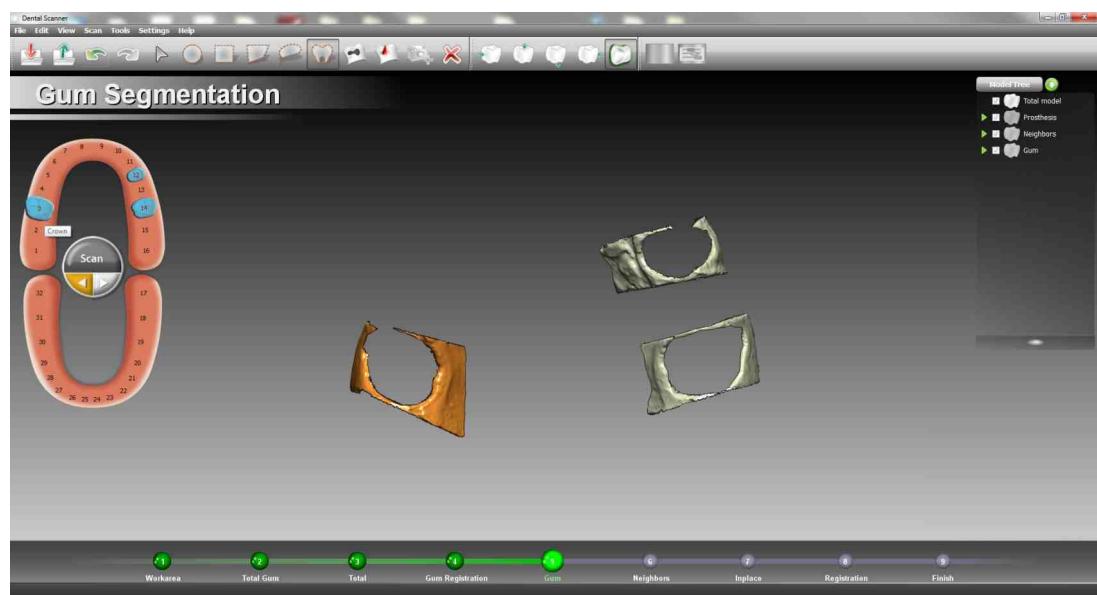
This Step is composed by two parts:

1. A not mandatory Registration of the two total model acquisitions
2. An semiautomatic segmentation. A specific tool for gum identification, accessible via the button is available. Using this tool and proper scanned total models, it's possible to isolate gum without the need of manual segmentation



Gum Assignment

Segmented gums must be linked to the proper tooth



5.2.1.9 Waxup

When Waxup option is checked the Scanner add four Steps to the Acquisition Workflow:

1. Total Waxup Model Acquisition
2. Total Waxup Model Registration
3. Waxup Acquisition
4. Waxup Registration

The purpose of these Steps is to acquire shape to be used instead of the default ones available from internal **DentalCAD** libraries. It means that some modeling job has to be performed to make the shape acquired compatible. This job is done in the Waxup Acquisition Step mainly using Delete and Fill hole commands

Total Waxup Model Acquisition

Total Model with Waxup is acquired, 8 positions by default. A Finalize is required



Total Waxup Model Registration

A not mandatory Registration of the two total model acquisitions is available if required

Waxup Acquisition

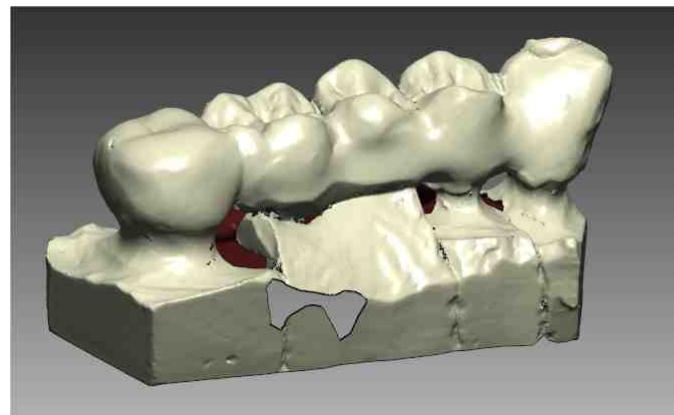
This Step is composed by two parts

1. The Waxup model is acquired, 5 positions by default. A Finalize is required.

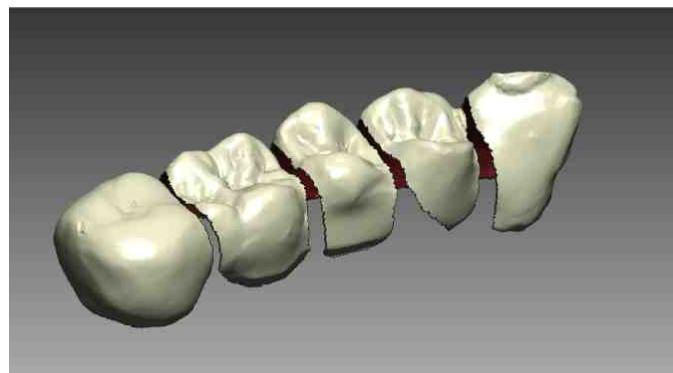


2. Segmentation and element linking is then required. Waxup has to be prepared in order to substitute library elements. It means the Waxup bottom has to have a regular hole in order to be able to connect to the Margin Ring. To achieve this result some modeling jobs is required using Delete and Fill hole commands:

1. Delete the Waxup support



2. Split the total shape in single shapes cutting connectors if present



3. Recreate lateral faces using fill hole command



4. Delete the bottom of the waxup in order to create the base hole



Waxup Registration

A not mandatory Registration of Waxup shapes is available if required. The reference model will be the Total Waxup Model

5.2.1.10 Antagonist

Antagonist

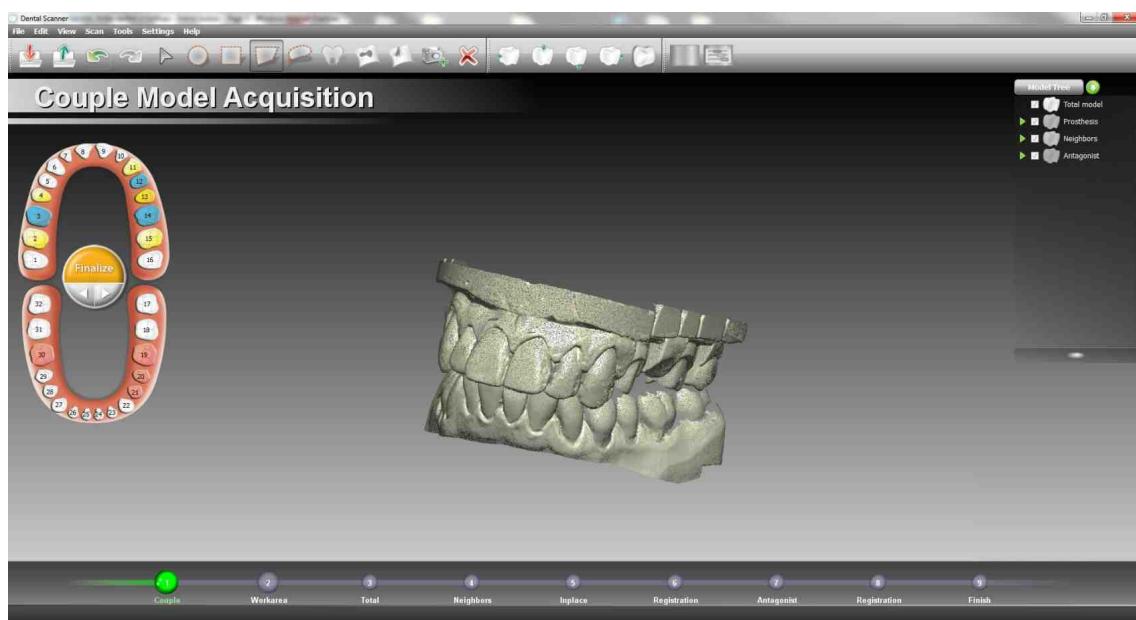
When Antagonists Option only is checked (no checkbite), the Scanner add three Steps to the Acquisition Workflow:

1. Couple Model Acquisition
2. Antagonists Acquisition
3. Antagonists Registration

Couple Model Acquisition



Acquire the Couple Model. A quick acquisition, 6 positions by default, of both arc jaws, superior and inferior, is performed.

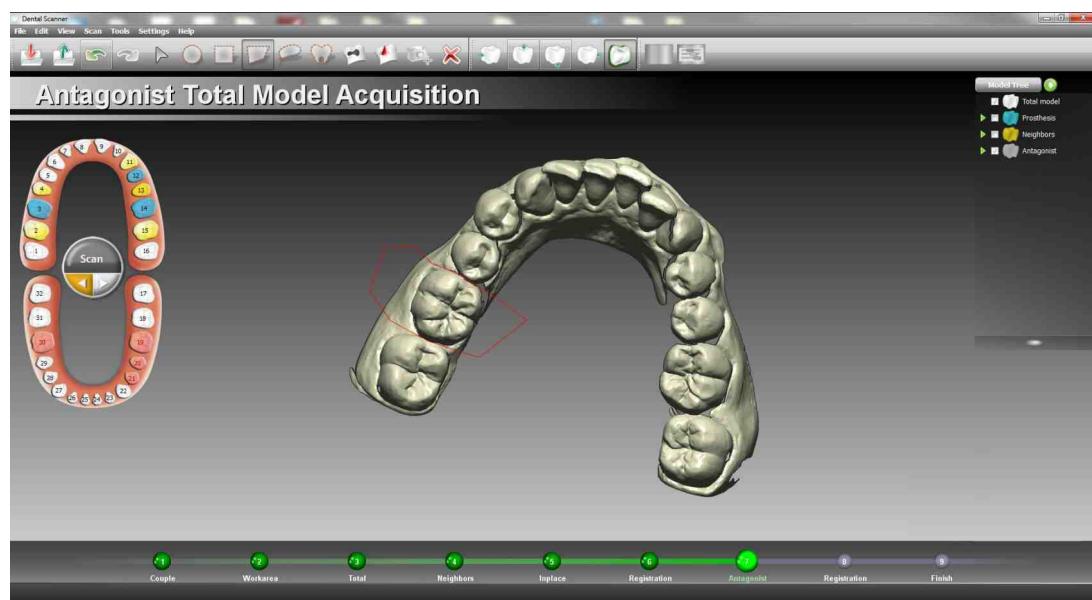


Antagonist Acquisition



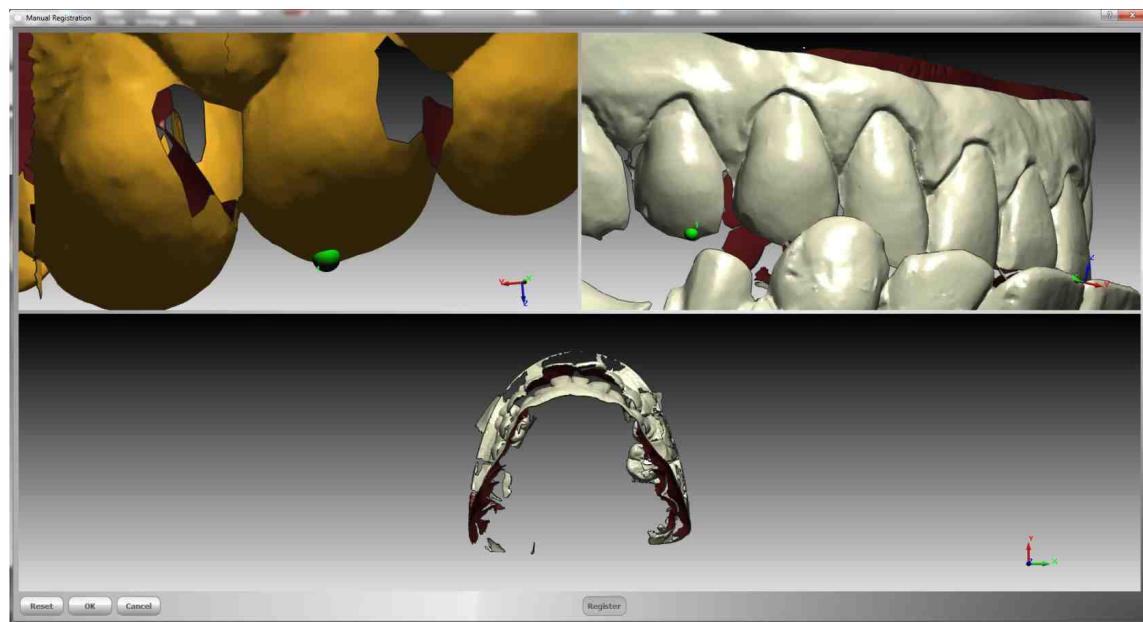
This Step is composed by two parts:

1. The user is required to scan the full antagonists arc jaw, 8 positions by default. A Finalize is required
2. Segmentation and element linking is then required



Antagonist Registration

Perform the registration between the antagonist jaw and the Model Couple by picking the contact points. Once all elements have been correctly registered the step is complete.



Checkbite

When Antagonist with Checkbite option is checked, the Scanner add one Steps to the Acquisition Workflow:

1. Checkbite acquisition



Checkbite acquisition

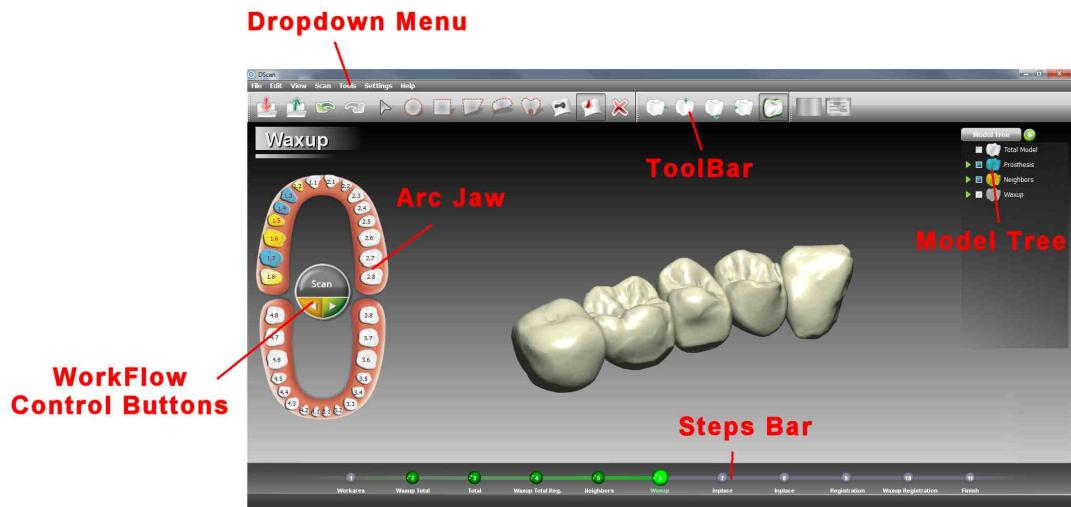
This Step is composed by two parts:

1. Total Model Acquisition with checkbite, 5 positions by default. A Finalize is required
2. At this point segmentation of the checkbite is needed to link each element to the proper tooth. After proper segmentation and linking the workflow proceeds in the standard way



5.2.2 UI Elements

Scanner general UI layout is showed below:

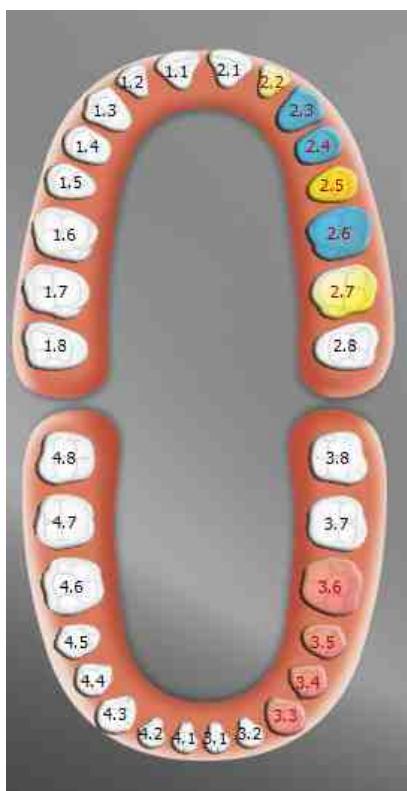


UI Elements include:

- Arc Jaw
- Workflow Control Buttons
- Model Tree
- Step Bar
- Toolbar Commands

5.2.2.1 Arc Jaw

The left panel indicates which tooth are needed by the Dental Scanner; the user is expected to load the elements.



5.2.2.2 Workflow Control Buttons

In the middle of the arc jaw on the left three buttons drive the Acquisition Workflow. More than one button can be active in the same time

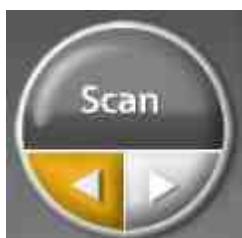


Next/Previous Buttons

When active (Green) it is possible to move to the next Step of Acquisition Workflow



When active (Yellow) it is possible to move to the previous Step of Acquisition Workflow



Actions Buttons

When active (Green) a Scan Step will be executed



When active (Red) a Scan Step is running. Using this button is possible to stop the Scanner. It immediately stops to acquire data and returns in zero axis position



When active (Yellow) a Finalize computation is performed. Data acquired by the scanner become meshes



When active (Blue) a Registration Step is performed



5.2.2.3 Model Tree

The right panel is the Model Tree that shows all the teeth loaded for each job defined.



Flag/Unflag the tooth drives its visibility. Mouse wheels drives the transparency

5.2.2.4 Step Bar

In the bottom of the screen the Step Bar shows all Acquisition Workflow Steps and highlight the current one



It is possible to jump from one Step to another one simply clicking on the green button.

5.2.2.5 Toolbar Commands

In the following, for each command of the toolbar image, from left to right, a brief description is provided.



5.2.2.5.1 Import Files



An Open file dialog pop up allowing the user to load multiple STL files in the scanner

5.2.2.5.2 Export Files



An Export Files dialog pop up allowing the user to export multiple STL files from the scanner

5.2.2.5.3 Undo/Redo



Undoes or Redoes last operation

5.2.2.5.4 Mesh Selectors



- Disabled selection: Switch to this tool when you want to simply navigate on model without any active selector



- Point selection: allows to select all the triangles inside a small circular region



- Rectangle selection: allows to select all triangles inside a rectangular region



- Polygon selection: allows to select all triangles inside a polygonal region



- Lazo selection: allows to select all triangles inside a free-hand closed region



- Cluster selection: selects all triangles in the picked cluster

5.2.2.5.5 Fill holes



Fills the holes in the mesh

5.2.2.5.6 Spike Removal



Flatten the triangles in a small area defined by polygon selection

5.2.2.5.7 Delete Selected triangles



Removes all the selected triangles

5.2.2.5.8 Standard Views



Sets the viewport to a standard direction

5.2.2.5.9 Show /Hide Mesh Borders



Graphical display option for showing or not the borders of the mesh in highlight

5.2.2.5.10 Show colormap

Enable/Disable the colormap while registering the elements

5.2.2.5.11 Gum registration slider

The slider is active only when acquiring the gum, refer to Gum for details on its usage

5.3 Preferences

It is possible to configure application parameters from drop down menu:

Setting -> Preferences

the dialog box has several tabs. See below for details

General



- UI Language: changes the user interface language
- Output format: changes the type of teeth nomenclature

Visualization



- ArcJaw Size: size of the arcjaw picture on the left side of the viewport;
- Antialiasing: enables the antialias filter;
- Steps bar animation: enables/disables the progress bar animation;
- Steps title: enables/disables the step title above the workjaw;
- Translucency widgets: enables/disables alpha blending on the viewport widgets;
- Only active teeth in the model tree: hide/show non active teeth in the model tree;
- Background image: show/hide background image;
- Graphic card memory: which must be disabled to bypass visualization errors when running **DentalCAD** in a low-end workstation.

Registration



- Set minimum and maximum tolerance of the color filter, while the registration algorithm is running

Chronology



- Enable/Disable chronology; press the CANCEL CHRONOLOGY button to clear the process list.

Acquisition



- Adjust the height of the scanning area.

